076107

JPRS 82665

18 January 1983

China Report

ECONOMIC AFFAIRS

No. 301

ENERGY: STATUS AND DEVELOPMENT -- XIII

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COAL

NEW METHODS FOR FORECASTING ENERGY NEEDS EXPLORED

Taiyuan JINGJI WENTI [PROBLEMS IN ECONOMICS] in Chinese No 8, 25 Aug 82
pp 27-32

[Article by Zhai Ligong [5049 4539 0501]: "Exploring Problems in Forecasting Development of China's Energy Resources"]

[Text] Energy is an important material foundation for economic development. To a very great extent, development of the overall national economy benefits both from the development and use of energy resources and is, at the same time, restricted within certain limits by the energy supply. Accompanying the development of science and technology, the degree of socio-economic dependence on energy resources steadily increases. China's long-time shortage of energy resources has created tremendous losses for social production and caused many inconveniences in the life of the people. Cries from all quarters for a conscientious solution to the energy shortage have become increasingly loud. Consequently, correct understanding of the key role of energy in the national economy and rather precise formulation of genuinely workable plans for energy development doubtlessly hold extremely important strategic significance.

Since the world energy crisis of 1974, individual countries have flocked to study problems in development of energy resources in a general craze for energy study. Currently, the following major methods are used in the world at large, and in China, for studying energy development forecasting:

1. Economic Statistical Analysis Method

After studying economic statistical data for 1975 from 84 developing countries, the National Energy Analysis Center of the Federal Brookhaven Laboratories in the United States found that where annual average per capita gross national product is equivalent to $1,000, average annual per capita energy consumption is between 1.55 and 1.6 tons of standard fuel. These experimental statistical data were used to forecast that by the year 2000, by which time China will be comparatively well off, its population, which will total 1.2 billion, (and the same population figure will be used subsequently) will require 1.92 billion tons of energy, figuring a per capita energy consumption of 1.6 tons of standard fuel.

2. Energy Consumption Increase, Coefficient of Elasticity Analysis Method

Foreign economists usually use the rate of increase in gross national product as an indicator of the macro-economy to analyze energy consumption increase coefficients. They then use the proportional relationship between the total annual rate of increase in energy consumption and the annual rate of increase of gross national product to formulate the coefficient of elasticity of energy consumption increase. Each country can then predict the quantity of its energy consumption on the basis of the tendency toward change of this coefficient. China's energy consumption increase coefficient of elasticity for the period 1950-1975, as calculated by using gross output value of industrial and agricultural production instead of gross national product, averaged out at 1.24. This equaled the average value for developing countries during the 1960's, or equaled that of economically developed countries during the early period of their industrialization. On the basis of this method of forecasting, if China improves future energy management, conserves use of energy, and raises its scientific and technical levels, it will be able to reduce its energy consumption increase coefficient of elasticity from 1.24 to 1 (which would be equivalent to the average level of economically developed countries during the 1960's). By extrapolation, in the year 2000, China will need 2.278 billion tons of standard energy, or an average of 1.89 tons per capita.

3. End Consumption Analysis Method

This method supposes that in a certain sense all of a society's energy consumption becomes congealed, in the final analysis, in various end products, and that with the exception of products exported or used in national defense, all end products are consumed by individuals or the society. Consequently, it is possible to determine the population's average quantity of energy consumption and total consumption for the country as a whole from the angle of satisfying energy needs for daily life. (Steinhart), an American, has studied modern societies in which living standards have reached a comfortable level, and he has determined on the basis of calculation of energy consumption per day per capita for food, clothing, housing, transportation, and other purposes that annual average minimum energy consumption is 1.615 tons of standard fuel. Extrapolating from this conclusion, by the year 2000 China will need 1.938 billion tons of standard fuel.

Though the foregoing three methods for studying trends in development of energy resources have desirable points, they are inadequate in some respects.

First of all, all three of these methods predict only energy requirements, but energy is a product having extremely broad uses in a national economy. Viewed in terms of overall national economic development, forecasts of energy development should forecast not only requirements and quantity of production, but should also forecast the quantity of investment to be spent in capital construction needed to increase a country's production of energy.

Second, though the third method is a fairly scientific one, nevertheless, China has yet to do the ground work in this regard. Only after a large amount of work has been done can this method be used. Therefore, foreign calculations cannot be simply applied to prediction of China's energy development.

Third, the first and second methods of prediction both use the speed of development of gross national product as a macro-economy indicator to set up a proportional relationship with energy consumption. Today, more than 150 of the world's capitalist countries and developing countries use "gross national product" (GNP) as an indicator of output value, but this indicator has not been adopted as yet in China's statistical work. Usually either gross industrial output value or gross industrial and agricultural output value are used to set up a relationship with energy consumption. But gross industrial output value or gross industrial and agricultural output value contain repetitive computations of numerous variable values (including energy consumption), and many serious deficiencies exist in them. Use of their speed of growth to represent national economic growth, and the energy consumption increase coefficients of elasticity calculated on the basis of comparisons of energy consumption increases cannot accurately reflect quantitatively the proportional relationship between energy consumption and national economic growth.

The gross national product indicator used internationally deducts, on the one hand, all materials consumed in the production process (including energy consumption), and also includes depreciation and net output value of all tertiary industries [service trades]. Use of this indicator for comparison with energy consumption to compute the coefficient of elasticity of energy consumption increase is somewhat more accurate.

Inasmuch as China does not currently have the statistical indicator of gross national product, I believe national income can be substituted as an indicator. According to Marxist economic theory, national income is the sum total of new value created during a specific period of time (usually calculated annually) by workers in the goods production sector. In value terms it is the aggregate value of all the goods produced within a specific period of time ($c + v + m$), minus the value of means of production consumed at the same time c, that is, $v + m$. In material terms it is the total of social goods produced within a certain period of time (including the means of production and the means of livelihood) minus the total of social goods produced by consumption of the means of production during the same period of time. This shows that national income may act as a comprehensive economic indicator to reflect the essence of national economic development. Therefore, use of the speed of national income growth as an indicator of the macro-economy to analyze the proportional relationship between development of the national economy and increase in energy consumption, as well as to forecast future development of energy, is somewhat more appropriate than the gross output value of industry or the gross output value of industry and agriculture.

The proportional relationship between speed of increase in energy consumption and speed of increase in national income may be expressed in the following formula:

or (1)

In this formula:

K -- coefficient of elasticity of increase in energy consumption
Eg -- speed of increase in energy consumption
Ng -- speed of increase in national income
ΔEt -- new increase in energy consumption during present period
Et-1 -- energy consumption during previous period
Δyt -- new increase in national income during present period
yt-1 -- national income during previous period

In this formula, the coefficient of elasticity of increa ... y c ... sumption forms a direct ratio with the speed of increase ... con ... tion, and forms an inverse ratio with the speed of incre ... income.

$$K = \frac{Eg}{Ng} \qquad K = \frac{\frac{\Delta Et}{Et-1}}{\frac{\Delta yt}{yt-1}}$$

Practice in economically advanced countries has shown under circumstances of normal economic development at a specific stage that the aggregate of energy consumption and speed of increase, and development of the national economy and its rate of growth form a direct ratio. The greater the energy consumption, the higher the total value of national income. The less the total energy consumption, the less the total value of national income. For example, in 1976 total energy consumption in the United States was 2.486 billion tons of standard fuel, and national income was $1,511,800,000,000. In the USSR, energy consumption totaled 1.345 billion tons of standard fuel and national income was $506.6 billion. In Japan, energy consumption totaled 415 million tons of standard fuel, and national income was $472.8 billion. In addition, when the speed of increase in energy consumption was rapid, the speed of increase in national income was rapid. Conversely, when national income increased slowly, energy consumption increased slowly too. During the period 1950-1965, for example, energy consumption in Japan averaged a 9.5 percent increase annually and national income averaged a 9.8 percent annual increase, while during the period 1965-1970 energy consumption increased at an average rate of 14.2 percent annually and national income increased at an average 11.6 percent annual rate.

Since rates of economic development differ from one country to another, and since both the speed of increase in energy consumption and the speed of growth of national income also vary, the coefficients of elasticity between the speed of increase in energy consumption and the speed of growth of the national economy will not be the same. Each country has to proceed from its own prevailing economic conditions and consumption levels to select a

workable coefficient of elasticity of increase in energy consumption for use in forecasting energy development. During the period 1953-1979, energy consumption in China increased at a rate of 9.6 percent while national income increased at a rate of 6.1 percent. The coefficient of elasticity for increase in energy consumption was 1.57. Such a high coefficient of elasticity shows not only that our economy is still undeveloped, but also shows that management is not good and waste is severe. If vigorous future efforts are made in energy conservation, the heat utilization rate is increased, and the structure of the national economy turns into the optimum economic structure, the energy consumption coefficient should decline, or even fall to the approximate 1.08 of the period from 1965 to 1975. Looked at in terms of the country's current economic conditions and the coefficient of elasticity for increase in energy consumption, with efforts in energy conservation, the coefficient of elasticity can be controlled at 1.25 or around 1.

In forecasting energy development, both qualitative and quantitative analysis are required. Though energy development forecasting is affected by levels of development of productivity and the degree of equitableness in production relationships, such as structure of the national economy, speed of economic and population increase, levels of science and technology, structure of energy production and consumption, quantities of imports and exports, domestic reserves, energy pricing policies, technical equipment levels, rationality of production technology, management levels, and geographic conditions, as well as natural resources or even how high the people's standard of living, etc., which make an extremely complex problem, still, in proceeding from the macrocosmic angle of national economic development, the main focuses of forecasting are amount of energy required, output, and total amount of investment in capital construction.

1. Forecasting Total Energy Requirements

If development and application of science and technology are major elements in national economic development, then development and use of energy are the wings on which the national economy takes off. Historically, mankind's development and use of energy has been one of repeated renewal and replacement, making social productivity's transition from the steam age to the electric age. Today the atomic energy electric power generating industry is gradually developing in industrially advanced countries, and the world has begun to enter the age of atomic energy. Each energy revolution impels qualitative changes and leaps in social productivity. In addition, it gives impetus to constant rapid growth of the national economy at a new speed. However, because people were comparatively stable in their use of energy at certain historical stages, to a certain extent growth of national economies was transformed by the level of energy consumption. If one does not take into consideration the other factors that affect national economic growth, and only treats them as helping energy consumption, the following several proportional relationships will be produced between energy consumption and the national economy:

1. A specific quantity of economic income is the result of the consumption of a specific quantity of energy. So long as other conditions do not change,

in order to maintain the national income level of the previous period during the present period, it will be necessary to maintain the level of energy consumption at that of the previous period. Should the former energy consumption level decline, the national income level will decline along with it.

2. If one wants to make national income increase during the present period above and beyond that of the previous period, it will be necessary to increase anew the quantity of energy consumption above and beyond total energy consumption of the previous period. The newly added national income of the present period is, in fact, the result of the consumption of newly added energy consumption.

3. All national income during the present period is the total of the maintenance of all national income of the previous period plus newly added national income of the present period. All energy consumption in the present period is the total of maintenance of the quantity of energy consumed during the previous period plus the newly added quantity of energy consumption in the present period. The proportional relationship between them may be expressed in the following formula:

$$E_t = E_{t-1} + \Delta E_t \qquad (2)$$

On the basis of the coefficient of elasticity formula for increase in energy consumption, the following may be derived:

$$\Delta E_t = E_{t-1} \cdot K \cdot \frac{\Delta Y_t}{Y_{t-1}} \qquad (3)$$

Substitution of (3) for (2) derives:

$$E_t = E_{t-1}\left(1 + K \cdot \frac{\Delta Y_t}{Y_{t-1}}\right) \qquad (4)$$

This is to say that quantity of energy consumed during this period = quantity of energy consumed during the previous period x (1 + coefficient of elasticity of increase in energy consumption x the speed of national income growth).

In the above formula, quantity of energy consumed during the present period (that is the total energy requirement) is affected by and restricted by the quantity of energy consumption during the previous period, the coefficient of elasticity for energy consumption increase, and speed of increase in national income. If any of these items is arbitrarily increased or decreased, that can cause an increase or a decrease in quantity of energy consumption. In the normal development of a national economy, the quantity of energy consumption during the previous period is a known quantity, and if the national economy grows at a fixed rate, the amount of energy consumption and the coefficient of elasticity for increase in energy consumption will form a direct ratio; the higher the coefficient of elasticity, the greater the total energy requirement, and vice versa. If a society wants to maintain both a certain speed of national economic growth and yet cannot increase

total energy requirements rapidly, it must strengthen energy management, raise the heat utilization efficiency rate, change the economic structure, and adopt effective measures to save energy in order to control total energy requirements within proper limits. If energy conservation work is done well and the coefficient of elasticity for energy consumption increase declines, total energy requirements will also contract proportionately. However, looked at in terms of long-term trends in development, growth of national economy forms a direct ratio with increase in energy consumption. Thus, in considering long-term energy policies, a proportional relationship between energy development and development of the national income must be maintained. If it is not, growth of the national economy may drop as a result of a decline in the speed of increase in energy consumption.

Research based on the foregoing theories and methods can help in making some macro-forecasts of China's energy needs for the next 20 years.

Supposing average annual incremental increases in China's national income during the next 20 years at respective 4, 6, and 8 percent rates of increase, and supposing that as a result of economic readjustment and vigorous energy conservation work that a drop occurs in the coefficient of elasticity for increase in energy consumption from 1.57 of the 1950-1979 period to 1.25 (1985), and to 1 (after 1990), respectively, forecast results would be as follows:

Table 2. Total Energy Requirements 1985-2000

Unit: 100 million tons

Average annual rate of national income increase %	1979 energy consumption	1985 A	1990 B	1995 B	2000 B
4	5.9	7.9	9	11	13.4
6	5.9	9.0	10.6	14.2	19
8	5.9	10.6	14	20.5	30.1

Note (applies to subsequent references as well):
A: Coefficient of elasticity for increase in energy consumption is 1.25;
B: Coefficient of elasticity for increase in energy consumption is 1.

2. Forecasting Quantity of Energy Production

Forecasting of total energy requirements determines only the energy requirements for development of the national economy. Satisfaction of these requirements requires reliance on domestic production with imports from abroad to make up shortages. Energy resources and living conditions vary from one country to another, and within any given country the degree of self-sufficiency in production and reliance on imports from abroad also differ. On the one hand, no matter the reasons for importation of energy from abroad or the uses to which it is put, inasmuch as the country does

not have to produce it, this portion should be deduced from total requirements. On the other hand, if for various other reasons it is necessary to use a portion of domestic production for export or to increase domestic energy reserves, even though the energy used for effort or to build up domestic reserves is not consumed domestically or not consumed during the forecast period, it still has to be produced domestically and in the present period. Therefore, energy output forecasts should add in the quantities used for export and for building up domestic reserves. If this element is overlooked, it will result in a shortage of energy supplies leading to a squeeze on domestic consumption in order to be able to assure domestic reserve and export needs, or a squeeze on domestic reserves and exports to satisfy domestic consumption needs. Alternatively shortages may result for domestic consumption, domestic reserves, and exports, which no one can satisfy, causing tremendous losses in national economic development. These elements are both interdependent and mutually restrictive and the aggregate of these self-cancelling elements make up the particular energy production situation of a country at a specific period of time. The formula given below may be used to express the proportional relationships among them:

$$Pt = Et - Imt + E \times t + Rt \tag{5}$$

In this formula:

Pt -- Energy output for this period
Imt -- Energy imports for this period
E x t -- Energy exports for this period
Rt -- Domestic energy reserves for this period

Substitution of formula (4) for formula (5) derives:

$$Pt = Et-1\ (1 + K \cdot \frac{\Delta yt}{yt\text{-}1}) - Imt + Ext + Rt \tag{6}$$

This means that energy output for this period = energy consumption during this period - energy imports for this period + energy exports for this period = domestic energy reserves for this period, or energy output for this period = energy consumption during the previous period x (1 + the coefficient of elasticity for increase in energy consumption for this period x the speed of national income increase) - energy imports during this period = energy exports during this period = energy reserves during this period.

Using the foregoing forecasting method, China's energy output for the next 20 years may be forecast. In hypothesizing exports of energy products, considering that China's current petroleum reserve prospects are unclear, no tremendous increases in petroleum exports will be possible (if a good job is done of domestic conservation work, or once action has been taken to substitute coal for petroleum, means may be found to increase exports

slightly). Figuring the volume of petroleum exports on the basis of the 20 million tons of standard fuel of 1979, since coal resources are abundant, with proper arrangements, a 10 percent annual increase in exports may be figured above and beyond 1979's exports of 4,627,000 tons (converted to 3,303,600 tons of standard fuel). Figuring energy imports at the 3 million tons of 1978, and domestic reserves (including revolving supplies in storage in production enterprises) at an annual 3 percent of output, forecast results are as follows:

Table 3. Energy Output 1985-2000

Unit: 100 million tons

Average annual rate of national income increase (%)	1979 energy consumption	1985 A	1990 B	1995 B	2000 B
4	6.26	8.3	9.5	11.5	14.2
6	6.26	9.5	10.3	14.9	20
8	6.26	11.1	14.7	21.5	31.4

3. Forecasting Amount of Investment in Capital Construction for Energy Development

Forecasting energy development capital construction investment consists mostly of forecasting the funds that society is to allocate to the energy production sector for use in total expansion of reproduction (including some simple reproduction), so that society will have scientifically based forecasts on which to rely in allocating capital construction investment to the energy production sector, and insure that energy development meets the needs of development of the entire national economy.

By expansion of reproduction in the energy production sector is meant expansion of energy production capacity. By some simple reproduction is meant production capacity used to make up for natural wear and tear. The combination of these two are frequently expressed in terms of output added following making good the output of production capacity lost through natural wear and tear. Therefore, in a certain sense energy development capital construction investment is nothing more than the capital construction funds required to be invested to add new energy output. Of course, in addition to relying on capital construction investment for increases, newly added energy output also requires strengthening of enterprise management, improvement in labor productivity rates, and even better mining or recovery. It is possible to increase output without investment in capital construction. However, the latter is limited by the amount of geological reserves and mining conditions, which determine that results will be obtained only for a certain period of time and to a certain extent; it cannot last for a long period of time. Therefore, its ratio to newly added energy output is not too great. Capital construction investment to increase energy output is still the decisive factor. The relationship between newly added energy output and capital construction investment may be expressed in the following formula:

$$Iet = \Delta Pt \cdot Cet \qquad (7)$$

In this formula:

Iet -- Energy capital construction investment in this period
ΔPt -- Newly added energy output during this period
Cet -- Investment coefficient per unit of energy for this period

Since
$$\Delta Pt = Pt - Pt\text{-}1 \qquad (8)$$

by substituting formula (8) for formula (7) the following is derived:

$$Iet = (Pt - Pt_{-1}) \cdot Cet \qquad (9)$$

By substituting formula (6) for formula (9), the following is obtained:

$$Iet = \left\{ [Et-1\ (1 + K \cdot \frac{\Delta yt}{yt_{-1}}) - Imt + EXt + Rt] - Pt_{-1} \right\} \cdot Cet$$

This means that energy investment during this period = {[amount of energy consumed during previous period x (1 + the coefficient of elasticity for increase in energy consumption for this period x the speed of increase in national income during this period) - quantity of energy imported during this period + quantity of energy exported during this period + domestic energy reserves during this period] - amount of energy during previous period} x coefficient of investment per unit of energy during this period.

The above formula shows that energy investment and newly added energy output during this period, taken together with the coefficient of investment per unit of energy during this period, forms a direct ratio. When the coefficient of investment per unit of energy is fixed, the greater the newly added energy output, the greater the investment in energy, and when the newly added energy output is fixed, the greater the coefficient of investment per unit of area, the greater the investment in energy. Assuming that for various reasons the coefficient of investment per unit of energy is greater than during the previous period, if the investment figure society allots to the energy sector is the same as during the previous period, the newly added energy output of the previous output will be unobtainable. If society increases the energy investment figure on grounds other than the increased proportion of the coefficient of investment per unit of energy, that will cause a shortage in energy supply and require increase in imports to satisfy energy supply needs, requiring a slowing of the speed of increase in national income. If one wants to both maintain the speed of increase of national income and expand the quantity of energy imports, it will be necessary to add to investment in energy to the extent of the increase in the coefficient of investment per unit of energy.

Assuming a curtailment in the previous coefficient of investment per unit of energy, provided that society carries out construction while maintaining the national income of the previous period, it can reduce the amount of investment in energy in proportion to the curtailment of the coefficient of investment per unit of area. Practice in economic development has shown that because of scientific and technical developments the organic composition of various newly built energy production enterprises has gradually improved, the degree of technical intensiveness has become increasingly great, and the trend of development for investment coefficients per unit of energy have gradually become larger. For example, the aggregate coefficient of investment in newly added coal production capacity in the coal industry averaged 56 yuan per ton during the "First Five-Year Plan"; during the "Second Five-Year Plan," it averaged 63.53 yuan; during the period of readjustment (1963-1965), it was 108 yuan; during the "Third Five-Year Plan," it was 76.08 yuan; during the "Fourth and Fifth Five-Year Plan," it was 19.30 yuan, and between 1976 and 1979 it was 195.90 yuan. Thus, the capital construction investment that society allocates to the energy sector should increase as the coefficient of investment per unit of energy increases. Of course, increases in the coefficient of investment per unit of energy include a certain amount of decline in results from investment and waste. In setting new coefficients of investment per unit of energy, it is necessary to get rid of these irrational components.

On the basis of the foregoing forecasting methods, the figures for the investment required in China for the next 20 years can be forecast. Assuming that following readjustment, restructuring, reorganization and upgrading of the national economy the capital construction cycle in the energy sector can be shortened to about 5 years, and the coefficient of investment per unit of newly added energy will be 22 billion yuan per 100 million tons on the basis of the coefficient of investment per unit of newly added energy for the 5-year period 1975-1979, forecast results would be as follows:

Table 4. Requirement Investment in Energy 1986-2000

Average annual rate of national income increase %	1975-1979 Coefficient of investment per unit of newly added energy 100 million yuan/ 100 million tons	1986-1990 (100 million yuan) A	1991-1995 (100 million yuan) B	1996-2000 (100 million yuan) B
4	220	506 (2.3)	442.2 (2.01)	594 (2.7)
6	220	858 (3.9)	858 (3.9)	1122 (5.1)
8	220	1518 (6.9)	1496 (6.8)	2178 (9.9)

Note:
A: Coefficient of elasticity for increase in energy consumption is 1.25.
B: Coefficient of elasticity for increase in energy consumption is 1.
Figures in parentheses are newly added energy outputs; units are 100 million tons.

China's future total energy capital construction investment figure will be substantial, and it seems that sole reliance on the state for these funds will pose very great difficulties. However, through economic readjustment and restructuring of the management system the problem can be satisfactorily solved. Formerly, as a result of being under the guidance of a centralized planned economy, energy industries were substantially operated by the state, and each jurisdiction sat and waited for the state to allocate energy products according to specific channels. Local investment resources were largely overconcentrated in high profit processing industries, with the result that energy industries became bogged in a situation of few producers and large numbers of users. Moreover, the processing industries tried to do several things at once and rushed headlong into action, with the result that serious proportional imbalance occurred between energy industries and processing industries. Whenever the subject of development of energy industries was raised, they put out their hands to the state for investment funds, while at the same time every area put out its hands to the state for energy products. If in the process of economic readjustment we change this passive situation of sole reliance on the state for investment, loosen policies a little, and allow each jurisdiction to take some of its own investment resources for investment in the energy industry sector, when the state distributes energy products, it can take from plan some of the amount to be distributed and distribute it on the basis of the amount of investment in the energy sector of each jurisdiction, those who invested more getting more, those who invested less getting less, and those who did not invest getting nothing. Alternatively, a portion of investment resources could be invested in places having energy resources in compensatory trade with these places. In this way the investment each jurisdiction uses in processing industries could be attracted into energy industries. This would both solve the problem of insufficient investment in the energy industry and would also curtail the processing industries; it would, in fact, be a form of economic readjustment. Were this to be done, an assured source of investment funds would exist for the energy industry sector and output would greatly develop as well. Therefore by taking appropriate measures, the foregoing forecasts would be possible of fulfillment.

It must be particularly emphasized that forecasts on energy development are predicated on normal economic development. All sorts of complex political and economic reasons may result in unbalanced economic development for a certain period of time, which will greatly affect the accuracy of forecasts. However, abnormal economic development is, after all, not a long-term phenomenon. Analyzed from the long-term angle, normal economic development is dominant; consequently, energy forecasting cannot be looked at solely in terms of China's economic readjustment of the past several years, the abnormal economic development regarded as immutable, or the abnormal economic development used as a basis for negating the validity of forecasts on economic development.

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CSO: 4013/39

POWER NETWORK

HEBEI POWER GENERATION CAPACITY TO BE DOUBLED WITHIN 10 YEARS

Shijiazhuang HEBEI RIBAO in Chinese 18 Sep 82 p 2

[Text] The leading members of the Electric Power Bureau of Hebei Province have been greatly stimulated by the introductory speech of Deng Xiaoping at the 12th Party Congress and the report of Hu Yaobang representing the Central Committee of the Communist Party. They have coordinated the serious study and the enthusiastic discussions within the electric power systems of our province. They have also encouraged our spirits and increased our confidence in fulfilling the 1981-1990 10-year plan to double power generation capacity. We will work very hard toward this general goal set by the Central Committee of the Communist Party.

Present Status and Future Plans

Since the 3d Plenum of the 11th Party Congress, there has been rapid progress and much change in the electric power industry of our province. As of 1981, there were 35 thermal and hydropower plants with capacities of 500 kilowatts or greater, with a total installed capacity of 3,284,890 kilowatts. There are 220-kilovolt transmission lines with a total length of 1,330 kilometers. There are 13 transformer stations with a total capacity of 213 million kva. There are 157 110-kv transmission lines with a total length of 4,020 kilometers, and there are 88 transformer stations with a total capacity of 3.8 million kva. Comparing 1981 with 1976, the generating capacity has increased by 1.05 million kilowatts in our province. However, agricultural electric power usage has increased by 3.33 billion and industrial power usage has increased by 3.37 billion kwh, thus the electric power shortage has remained very serious. The present estimate for the power shortage in our province is approximately 0.7 million kilowatts. Without a vigorous program of the expansion of electric power generation, there would be grave consequences in the slowdown of the economic developments of our province. The strategic objectives of the 12th Congress have emphasized the simultaneous developments in electric power generation and the national economy. After serious discussion and research, the leaders of the Electric Power Bureau have planned to increase the generating capacity of our province by 3.21 million kw in 1990 as compared to 1981 and an increase of 5 million kw by the year 2000.

Favorable Conditions

The report of the Hu Yaobang to the 12th Congress has listed energy problems as one of the strategically important points in economic development. This guarantees the rapid development of electric power generation as a secondary energy source.

There are rich coal resources in the mountainous regions in the western and northern parts of our province. Tangshan, Handan and Xingtai have plenty of coal, thus power stations may be constructed next to the coal mines. Coal resources in Shanxi Province are continuously being developed and may be used for power stations in regions west of Shijiazhuang and in regions near Zhangjiakou.

At present, many power generating stations are in the process of expansion and many new stations are under construction in our province. Under construction are two 200 mw units at Douhe power station, one 200 mw unit at the Matou station, and one 100 mw unit at the Xiahuayuan station. After completion, three more 200 mw units will be installed at the Douhe and Xiahuayuan stations. Ground has been broken for the 75 mw thermal power plant at Funrun. Construction will begin at the end of this year to add four 200 mw generating units to the generating plant at Xingtai. Rather large generating plants will be constructed at Shalinzi in the city of Zhangjiakou, at Shangan in Jingxing County and the city of Qinhuangdao, and are in the stages of site selection, surveying and design.

It is important to have a team with good technical expertise and long management experience for the construction, design and production tasks. Thus present power plants can be well managed, new power plants can be constructed quickly and reach full production status quickly.

The leaders have recognized that these favorable conditions guarantee rapid expansion in electric power generations. They will utilize these favorable conditions fully. They are also aware of many practical difficulties in the "first decade". For example, one-third of our present workers have less than a junior high school education and are not equipped for the present economic development. Furthermore, some machinery produced in our country is of poor quality with poor supplies of parts. Much hard work remains to be done to overcome these deficiencies.

Much Work To Be Done Right Now

A long journey begins with the first step. In order to double electric generating capacity in a decade, the leaders of the Electric Power Bureau of our province emphasized the importance of good current performance followed by good progress. We should strengthen our Communist teachings and should stress that everybody is working for his own country. Thus the general working force may be converted into a new work force indoctrinated with socialism. "Safety first" should be emphasized in the production of power. Safe procedures should be strictly followed for the safe and economic generation of electric power. Group efforts should be devoted to reforms, so that we can improve the maintainence and repair of equipment and improve the quality of

the equipment. Attention should be paid to instruments, insulation, metals, chemistry and thermodynamics. The automatic devices should be made safe and reliable. The general education, scientific and technical expertise of the work force should be improved. New technology and equipment should be introduced and electrical networks should be modernized. Further improvements in the planning of electric power consumption, power savings and services in power usage should also be made. Thus our present generating capacity will be more efficiently used, and future developments will hasten the rapid progress of the power-consuming industries.

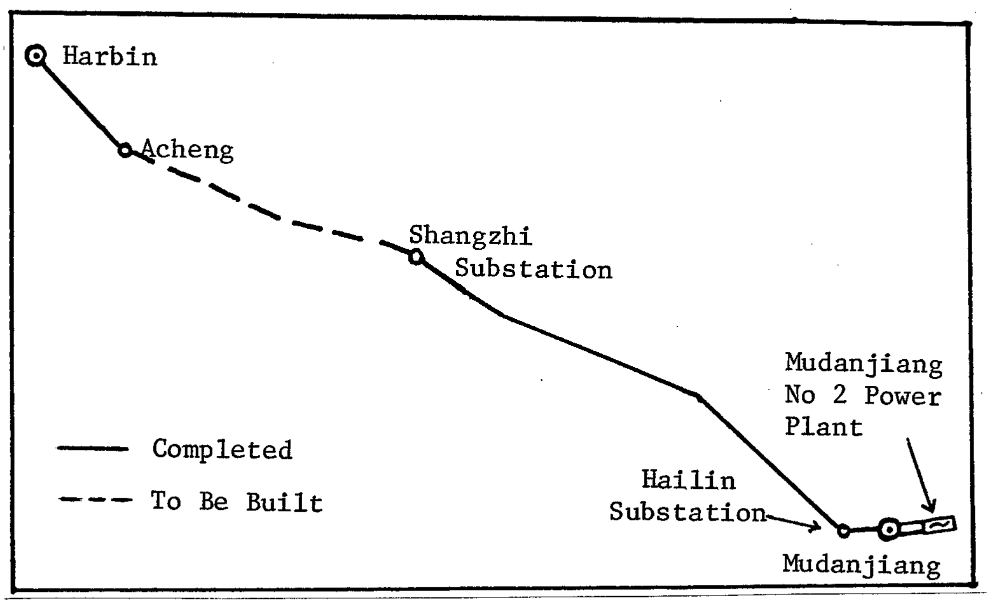
9899
CSO: 4013/14

POWER NETWORK

MUDANJIANG-SHANGZHI POWER LINE NOW OPERATIONAL

Harbin HEILONGJIANG RIBAO in Chinese 20 Nov 82 p 1

[Excerpt] The 220,000-volt high-tension transmission and transformer project from Mudanjiang to Shangzhi via Hailin was officially opened on 10 November. Test runs on the project were begun in early November and operations were normal during winter weather trials. The power that came originally from the Harbin network now comes from the Eastern Grid, helping to ease the city's power shortage by making an additional 400,000 kwh available to it. The completion of this project also lays a foundation for the future merging of the Harbin network and the Eastern Grid.



The Harbin power network supplies the city itself and 16 counties with electricity, from Wuchang and Shanhetun in the south to Suihua in the north and from Shangzhi in the east to Zhaodong in the west, about 25 percent of the power in the whole province. Last year, after the Xinhua-Harbin high-tension transmission line became operational, an average of almost 800,000 kwh a day was fed into the Harbin network, still not enough to meet demand. The completion of the Mudanjiang No 2 Power Plant adds a new power source

to the Eastern Grid, merging the Eastern Grid with that of Harbin, with each making up the other's deficiency with its surplus. Work on the Mudanjiang-Hailin-Shangzhi transmission line and the two large transformer stations began during the winter of 1981.

The Mudanjiang-Shangzhi transmission line has a total length of 170 kilometers, the greater portion being brought through sheer mountains under very difficult construction conditions.

CSO: 4013/85

FORUM ON ACCELERATING HYDROPOWER DEVELOPMENT HELD TO MARK 100TH ISSUE OF 'WATER POWER'

Beijing SHUILI FADIAN [WATER POWER] in Chinese, No 10, 12 Oct 82, p 3

[Article by Chen Shangkui [7115 0006 1145]: "To Mark the 100th Issue of WATER POWER, the Ministry of Water Conservancy and Electric Power Invited Experts To Discuss How To Hasten the Development of Hydroelectricity"]

[Text] on 14 August, the Ministry of Water Conservancy and Electric power held a commemorative forum in the West Room of the People's Hall to celebrate the 100th issue of WATER POWER.

The meeting was presided over by general manager of the General Water Conservancy and Hydroelectric Power Construction Company, Chen Gengyi [7115 6342 0308]. Attending the forum were the vice chairman of the International Dam Committee and chief engineer of the Ministry of Hydroelectric Power, Li Eding [2621 7725 7844], honorary chairman of the China Water Conservancy Society, Zhang Hanying [1728 0698 5391], chairman of the China Hydroelectric Power Engineering Society and professor at Qinghua University, Shi Jiayang [2457 0857 3568], member of the Academic Department of the Chinese Academy of Sciences and head of the Water Conservancy and Hydroelectric Institute, Lin Bingnan [2651 4426 0589], vice chairmen of the China Hydroelectric Engineering Society, Zhang Tiezheng [1728 6993 6927] and Zhang Changling [1728 2490 7881], experts, scholars and scientific and technical personnel engaged in hydroelectric power construction, leading cadres, and members of the news media totaling over 200 people. Among them were old experts, old scholars and old cadres who have struggled half their lives to serve hydroelectric power endeavors and there were also middle-aged and young scientific and technical workers now shouldering the responsibility of building hydroelectric power. Everyone gathered at one place and enthusiastically spoke. An atmosphere of unity and happiness filled the whole meeting room.

Attending comrades talked about the great achievements and experience realized in our nation's hydroelectric power over the last 32 years since liberation. In old China, from 1912, when the first hydroelectric power station (with an installed capacity of 1,440 kilowatts) was built, to 1949 on the eve of national liberation, a total of 37 years, the total hydropower installed capacity was only 160,000 kilowatts with an annual output of 700 million kilowatt-hours. After the founding of new China and after 32 years of efforts up to the end of 1981, the whole nation's total installed capacity of hydroelectricity

reached 21,000,000 kilowatt-hours with annual output of 65.5 billion kilowatt-hours, an increase of 130 times and 92 times respectively over 1949. We relied on our own strength, developed the wisdom and talent of our nation's hydroelectric power builders, worked hard, solved various technical difficulties, built a group of different types of hydroelectric power stations, such as the concrete gravity arch dam of 165 meters high in the complex limestone regions at Wujiangdu. We successfully blocked the flow in the Chang Jiang--the world's third largest river--and completed the first phase construction of the Gezhouba main hydroelectric power project with an installed capacity of 2,715,000 kilowatts. We tunneled more than 8,500 meters and built more than 8,600 meters of diversion tunnels for the Xier He first cascade hydroelectric power station and the Yuzi Xi first cascade hydroelectric power station. We are also building the second phase of the Gezhouba, Longyangxia, Tianshengqiao, and Baishan hydroelectric projects which are more complex and more difficult. Their total installed capacity is 10,580,000 kilowatts. In building these projects, many hydroelectric power builders remained for months and years in the deep mountains and valleys, deserts and plateaus, ate and slept outdoors, crossed mountains and waters, fought bitter cold and severe heat, paid dearly in labor, and some even gave their lives.

Experts believe our nation's hydroelectric power is progressing fully and the future is bright. According to the present condition in developing energy in our nation, and according to the long-range needs of future national economic development, we must fully develop the superiority of the abundance of hydraulic energy resources in our nation and hasten the development of hydroelectric power in a big way. For this, (1) we must quickly establish a strategic plan for the development of the nation's hydroelectric power. Hydroelectric power construction requires a longer time, there must be long-range plans of 10 to 20 years so that we can arrange preliminary work in scientific research, surveying and design. (2) We must actively open up sources of capital. We must open up ways to acquire more money to strive towards building more hydroelectric power projects. (3) We must strengthen preliminary work in scientific research, surveying and design and fight a well prepared war. We must begin to study the new problems of sending electricity from the west to the east, complex geological conditions and transportation difficulties early. (4) In developing hydroelectric power, the large, the medium and small projects must be combined. While building large backbone power stations, we must build more medium power stations that require less investment and that can produce quick results in the near term. We must also fully pay attention to developing small hydroelectricity in farm villages to solve the problem of the lack of electricity and the insufficient supply of electricity in over 40 percent of the production teams in our nation's farm villages. (5) We must quickly establish some basic policies to hasten the development of hydroelectric power, especially the problem concerning compensation for flooding by reservoirs to avoid increasing the investment in power stations and missing the opportunities. (6) We must solve the problems in external cooperative relationships. Hydroelectric power construction involves water conservancy, transportation and aquatic production, and the machinery and materials sectors must also supply qualified equipment and raw materials. It is also inseparable from local support. Therefore, all sectors must cooperate with each other before hydroelectric power construction can be carried out smoothly.

(7) We must greatly improve technical and operating standards of the hydroelectric power construction team, strengthen scientific management, shorten the construction period, improve quality, reduce cost to increase the economic benefits of hydroelectric power construction on an overall basis.

Comrades participating in the forum unanimously believed that now that the magazine WATER POWER has reached its 100th issue since its inception in 1954, it has been closely linked to the development of hydroelectric power in our nation, it has reflected the growth, the course of improvement, the achievements and the experience of our nation's hydroelectric power buildup. It has served well in propagandizing the principles and policies of hydroelectric power construction, in exchanging technical experience, in exploring scientific and technological theory, in promoting the development of hydroelectric power and in elevating scientific and technical standards. Its outstanding point is that it can closely link efforts with the actual situation in our nation's hydroelectric power construction and serve as a channel for communication. It has a broad foundation among the masses and it is welcomed by a broad number of readers. The meeting hoped that every one of the 250,000 water conservancy and hydroelectric power workers will support this publication, help propagandize it and actively submit articles. It is also hoped that comrades of the editorial department will work harder, carefully organize articles, carefully edit the magazine, seek perfection, improve the magazine further so that it can serve an even greater function in pushing forward the development of our nation's hydroelectric power.

9296
CSO: 4013/22

EXPERTS, LEADING CADRES DISCUSS FUTURE GROWTH OF HYDROPOWER CONSTRUCTION

Fuzhou FUJIAN RIBAO in Chinese 18 Oct 82 p 4

[Article: "China to Build Ten Big Hydroelectric Power Bases Before the End of This Century"]

[Excerpts] Vice Minister of Water Conservancy and Electric Power Li Peng states that hydropower is a cheap, non-polluting, renewable energy resource the development of which conserves petroleum and coal resources, reduces the burden on transportation, and brings with it the multiple benefits of flood control, irrigation, and navigation. The earlier it is developed, the greater the benefits for the national economy. The Ministry of Water Conservancy and Electric Power has decided to accelerate hydropower construction and from now to the end of this century will concentrate its efforts on constructing ten big hydropower bases--where hydraulic resources are abundant and conditions suitable--on the middle and upper reaches of the Huang He, the Hongshui He, the middle and upper reaches of the Chang Jiang, the Yalong Jiang, the Dadu He, the Wu Jiang, the middle reaches of the Lancang Jiang, the Jinsha Jiang, and on rivers in the regions of western Hunan and Fujian-Zhejiang-Jiangxi. Work will be accelerated on Gezhouba, Longyangxia, Baishan, Tianshengqiao, Tongjiezi, Ankang, Dongjiang, Wan'an, Lubuge, Dahua, and other large-scale hydropower stations. To be built on the upper reaches of the Huang He are Daxia, Heishanxia or Daliushu, and Lijiaxia. To be built on the middle reaches of the Chang Jiang is Sanxia and Geheyan on the Qing Jiang. To be built on the Hongshui He are Yantan, and Longtan and on the Yalong Jiang, Ertan. Pengshui will be built on the Wu Jiang and Wuqiangxi on the Yun Shui. Manwan will be built on the Lancang Jiang, Shuikou on the Min Jiang, and Baozhu on the Bailong Jiang.

Vice Minister of Water Conservancy and Electric Power Li Daigeng and General Manager of the Water Conservancy and Electric Power Construction Company Chen Gengyi state that China's hydraulic resources are so abundant that they could provide 380,000,000 kilowatts if developed. China's already developed hydraulic resources constitute 3.4 percent of the exploitable resources and there is enormous potential for hydropower construction. Now planned is the development of over 100 million kilowatts.

They then optimistically summed up the favorable conditions for stepping up the pace of hydropower construction in the future: First, the party and state have devetoed much attention to the development of hydropower, stipulating that electric power output and construction meet local conditions;

in "increasingly putting the emphasis on hydroelectric power," they have drawn up correct general and specific policies and made the decision to spend more on hydropower construction. Next, it was the decision of the State Council to merge the former Ministry of Water Conservancy and Ministry of Electric Power and to create the Water Conservancy and Electric Power Construction Company, thereby bringing into being optimal conditions for the expansion of hydropower construction. In the 12-year period from 1969, when the nation's total installed capacity was 5,020,000 kilowatts, to 1981, when the total installed capacity was 21,000,000, the total installed capacity quadrupled. Of course, the kind of rapid growth of the last few years would require optimal conditions in the future, but even so it is entirely possible to realize across-the-board accelerated hydropower construction.

Chief Engineer Pan Jiazheng of the Water Conservancy and Hydroelectric Power Planning and Design Institute and Deputy Director Zhang Changling of the Hydroelectric Power Engineering Society add that there are other factors favorable to stepping up the pace of hydropower construction, namely a vast construction army of 250,000 people that has accumulated a wealth of experience in building all kinds of hydropower stations. That China has attained high technical levels in its hydropower construction is demonstrated by the graduation from stations of several hundred kilowatts built in the early days following Liberation, to stations of 10,000 kilowatts and over built during the fifties, to large-scale stations of more than 1 million kilowatts built in the sixties and seventies. Among these are Liujiaxia built in the sixties and Gezhouba, Wujiangdu, Longyangxia and other large-scale hydropower stations built in the seventies and eighties which, in planning, building and many other respects, have reached or even exceeded advanced world standards. Today, China is building its largest hydropower stations (3 million kilowatts) and its highest dam (175 meters) and is planning and designing projects on an even grander scale.

Li Daigeng recently stated that there is the ability and determination to push hydropower construction but enormous effort remains. He believes that with the collective effort of the personnel in the hydropower sector, hydropower construction will no doubt help usher in a new stage in socialist construction.

CSO: 4013/80

TAKING VIGOROUS MEASURES TO INCREASE OUTPUT OF EXISTING HYDROPOWER STATIONS

Beijing SHUILI FADIAN [WATER POWER] in Chinese, No 9, 12 Sep 82, pp 3-6

[Article by Shen Xinxiang [3088 0207 4382] and Guo Zhongxing [6753 0022 5281] of the Science and Technology Department of the Ministry of Water Conservancy and Electric Power: "Take Active Measures To Increase the Output of Existing Hydroelectric Power Stations"]

[Text] Over the past 30 years, although our nation's hydroelectric power buildup has traveled a difficult road, but, in general, development has been fast. Up to the end of 1981, the total installed capacity of hydroelectric power throughout the nation had reached 18,250,000 kilowatts (over 500 kilowatts) and the output reached 61.3 billion kilowatt-hours of electricity, constituting 20 percent of the total national output and equivalent to an annual conservation of 40,000,000 tons of raw coal. Great achievements have been realized. But on the other hand, some problems exist, and one of the main problems is that many power stations have not reached their designed output capabilities. Statistical data of the last 10 years shows that the actual annual output of electricity by large and medium hydroelectric power stations of over 12,000 kilowatts of installed capacity throughout the nation reached only 75 to 84 percent of designed output. Each year, they generated about 10 billion kilowatt-hours less than the designed output, equivalent to a loss of 7 million tons of raw coal each year. At present, the nation has over 90,000 hydroelectric power stations with installed capacity below 12,000 kilowatts. The designed output is difficult to check and statistically compiled, but according to estimates from the number of hours of utilization, the actual output of electricity is lower than the designed output. A comparison of the actual output of electricity and the designed output of large and medium hydroelectric power stations (over 12,000 kilowatts) during the last 10 years (1972-1981) in our nation is shown in Table 1.

Table 2 shows statistical data on the output of hydroelectricity of 7 foreign nations. It can be seen from Table 2 that when the installed capacity of hydroelectric power was about 18,000,000 kilowatts in some nations, the annual output of electricity was 71.9 to 105.8 billion kilowatt-hours, more than the annual output of hydroelectricity in our nation by 10.6 to 44.6 billion kilowatt-hours. The annual output of a unit kilowatt of installed capacity was

1.15 to 1.8 times that of our nation. This also showed that the output of hydroelectricity in our nation was much lower than the output of electricity in foreign nations with similar installed capacity.

Year	Actual output (100 million kilowatt-hours)	Designed output (100 million kilowatt-hours)	Actual-designed
1972	298	369	81%
1973	312	407	77%
1974	343	444	79%
1975	365	485	75%
1976	410	505	81%
1977	413	520	80%
1978	425	547	78%
1979	427	557	77%
1980	472	590	80%
1981	507	606	84%

Why is the actual output of electricity by our nation's hydroelectric power stations lower than the designed multiple-year average output and why is it also lower than the output of electricity of similar installed capacity in foreign nations? Generally speaking, there are the following reasons:

(I) Uneven Annual Volume of Incoming Water

Because the volume of water in the rivers is different every year, the output of electricity generated by the hydroelectric power stations is also different each year. In years of abundant water, more electricity can be generated, and in dry years, less electricity is generated. In the design, the designed output of hydroelectric power stations is generally determined by the multiple-year average output or the output of electricity during years of medium amounts of waterflow, and the hydrological data of several previous years are used as reference for the design. After a hydroelectric power station is built and begins production, the actual amount of incoming water of the rivers each year is frequently different from the amount of water of the hydrological series included in the design, and the monthly distribution of the amount of water is also different from year to year, therefore, the actual output of electricity each year never coincides with the designed output, i.e., in some years, the actual output may be lower than the designed output and in other years, it may be higher than the designed output. In our nation, the actual output is lower than the designed output every year, why? One objective reason is that the incoming amount of water is scarce. According to statistical analysis of the amount of incoming water in 32 rivers at 46 large and medium hydroelectric power stations in our nation, the average annual amount of incoming water during the recent 16 years was 294.5 billion cubic meters, 10 percent less than the multiple-year annual average amount of 327 billion cubic meters of incoming water used in the original design. Because of the drop in the amount of incoming water, the waterhead that can be utilized also correspondingly drops, and the actual output of electricity

Table 2. Comparison of our nation's output of hydroelectricity and the output of electricity in foreign nations when their installed capacity was similar to ours

Nation	China	U.S.	USSR	Japan	France	Canada	Brazil	Norway
Year	1981	1950	1962	1969	1977	1960	1976	1979
Installed capacity of hydroelectricity (10,000 kilowatts)	1825	1867.5	1862.2	1934.1	1860	1864.3	1841.1	1821
Percentage of installed capacity of hydroelectricity (%)	28.9	22.5	22.6	32.5	35.5	80.9	84.5	99
Output of hydroelectricity (100 million kilowatt-hours)	613	1010	719.44	797.23	761.37	1058.83	814.68	888
Difference in output between China and other nations (100 million kilowatt-hours)		+397	+106	+184	+148	+446	+202	+275
Annual output per kilowatt (kilowatt-hours/kilowatt)	3358	6030	3863	4122	4093	5679	4425	4876
Output of electricity of other nations as a multiple of that in China	1	1.8	1.15	1.23	1.22	1.69	1.33	1.45

by hydroelectric power stations is over 10 percent less than the designed output.

(II) The Actually Usable Amount of Hydroelectricity of the Power Network Is Smaller Than the Designed Output

The multiple-year average amount of output of hydroelectric power stations is calculated by multiplying the output of waterflow equal to or less than the installed capacity and time. Some power stations, especially in regions where the percentage of hydroelectricity is greater, generate a large amount of electricity during the period of abundant water, the load of the power network and the power transmission structure and transformers cannot bear such a large load of electricity, and thus water has to be abandoned. For example, hydroelectricity constitutes 50 percent of the Shaanxi-Gansu-Qinghai Power Network. From 1976 to 1980, the five-year average amount of waterflow at the Liujiaxia Hydroelectric Power Station was 885 cubic meters/second, 106 percent of the designed flow of 830 cubic meters/second (designed hydrological series 1919-1956). But because there is only one 330-kilovolt power line circuit transmitting electricity to Shaanxi, and because of the limitations of the local power network structure in Gansu, the energy of waterflow during the period of abundant water enables the hydroelectric power station to generate about 700 million kilowatt-hours of electricity, but because this amount cannot be utilized by the power network, it has to be abandoned. Also, the degree of utilization of seasonal electric power generated by the group of hydroelectric power stations with a poor regulatory function to realize mutual compensation between different rivers is also small. For example, the reservoirs of the Gongzui, Yingxiuwan, and Yuzi Xi hydroelectric power stations in western Sichuan are daily regulatory reservoirs, weekly regulatory reservoirs or non-regulatory reservoirs. Their regulatory function is poor, but natural runoff is abundant.

The monthly distribution of the amount of incoming water is very uneven. The multiple-year average amount of natural flow in the most abundant month (July) is about 7 times that of the month of least flow (February or March) and 1.8 to 2.4 times the amount of flow through the generators. Therefore, during the flooding period, a lot of water is abandoned also. On the average, the amount of would-be output of the water abandoned each year is equivalent to 300 million to 400 million kilowatt-hours, 5 to 7 percent of the designed annual output. During the dry season, the amount of electricity generated and the output also lessen greatly. Therefore, on the one hand, we should not include in the designed amount of electric power the amount of seasonal electric power which cannot be utilized in a rational power network structure. On the other hand, we should not establish enterprises that consume a large amount of usable seasonal electricity in areas with power shortages. We should establish them in regions with abundant hydroelectric power as much as possible and shorten the distance of transmission of electricity to fully utilize "white coal" to replace "black coal."

(III) Control of the Reservoirs of Hydroelectric Power Stations Is Not Rational Enough

The control of the reservoirs of hydroelectric power stations not only guarantees the safety of hydraulic engineering structures, serves a major function in reducing damage by floods, it is also an important factor in fully utilizing hydroenergy resources and developing the benefits of comprehensive utilization. Prior to 1979, rational and economical control of reservoirs was not emphasized by people for many years. With the addition of the shortage of electricity, hydroelectric power stations were frequently forced to over produce. Many hydroelectric power stations could not store and use water according to their design after they begin operation. They operated for long periods at a low water level, the percentage of water consumption increased while electric power dropped, output dropped, the equipment was damaged, and the gain in generating electricity was severely affected. According to incomplete statistics, prior to 1979, the whole nation lost over 2 billion kilowatt-hours of electricity each year because of poor control of the reservoirs. During the recent three years, trial regulations on the economical control of reservoirs of hydroelectric power stations were implemented and the situation visibly improved. But there are still many hydroelectric power stations that still cannot realize rational and economical control. For example, the cascade hydroelectric power stations at Liujiaxia, Yanguoxia and Bapanxia lose an estimated 300 million to 500 million kilowatt-hours of electricity each year because management of the upstream reservoirs on the Huang He, irrigation, water supply and conflicts in electricity generation have affected economical control. The cascade hydroelectric power stations on Yili He could not utilize the waterflow between the cascade stations because the amount of water used for irrigation increased onefold and because the reservoirs stilted. They suffered an annual loss of 100 million kilowatt-hours of electricity, constituting 6.3 percent of the designed output.

On the basis of rationally controlling reservoirs of hydroelectric power stations, and taking into consideration the hydrological laws of each river, the regulatory function of reservoirs and the concrete situation of the groups of reservoirs and power networks, we can use the Markov decision-making theory and random dynamic planning theory to establish mathematical models and take the maximum aount of output of electricity as the target function to realize optimal control of the reservoirs. In this way, we can generate more electricity. For example, the reservoir of the Zhexi Hydroelectric Power Station in Hunan selected the method of optimal control under allowable power network conditions based on forecasts of waterflow using computer-calculated results, sustained the time of high water level operation as much as possible, fully utilized the amount of water and the waterhead, and realized an annual increase of 150 million kilowatt-hours of output, constituting 6.5 percent of the total annual output of electricity. If all major hydroelectric power stations throughout the nation can carry out optimal control and utilize the characteristic that the actual efficiency of each hydraulic turbine is different to realize the most efficient load distribution and control between the generators, then calculating at an increased output of 3 to 5 percent throughout the nation, each year, 2 million to 3 million kilowatt-hours of electricity more can be generated on the basis of the original designed output.

Silting of mud and sand greatly affects the regulatory function of the reservoirs of hydroelectric power stations. This is also one reason for the reduced output of hydroelectric power stations. Because our nation's rivers have more mud and sand, silting in the reservoirs of many hydroelectric power stations is serious. According to statistics, the total reservoir capacity of our nation's 11 large reservoirs was 37 billion cubic meters. After the reservoirs were completed, silting occurred at an average rate of 850 million cubic meters a year. At present, silting has already taken up 10 billion cubic meters of reservoir capacity, constituting 1/4 the total. The reservoirs at Yanguoxia, and Qingtongxia and the second cascade reservoir on the Yili He have already been filled by silt and they have lost their regulatory function. They can only generate electricity from runoff.

(IV) The Efficiency of Hydraulic Turbines Is Low

Because of the hydraulic design and the testing and manufacturing technology, the efficiency of our nation's hydraulic turbines is still low. The highest efficiency of the mixed flow type hydraulic turbines which constitute 80 percent of all turbines is 91 to 93 percent. The turbines of some power stations, such as the Zhexi hydraulic turbines, have an actually measured efficiency of only 88 percent, lower than the guaranteed value by 3.5 percent. The efficiency of our nation's hydraulic turbines is even lower when compared to the highest efficiency of 94 to 95 percent of foreign turbines. If they operate with a low waterhead, the efficiency is still lower. For example, the hydraulic turbine at Xinfeng Jiang operating with a low waterhead of 50 meters has an efficiency lower than the designed waterhead of 73 meters by 5.5 percent. The highest efficiency of the propeller type hydraulic turbine manufactured in our nation is 1 to 2 percent lower than that of the equipment of advanced foreign nations, and the highest efficiency range is within 25 percent to 65 percent of the load. When the generator operates constantly in the highest load range, the efficiency drops further by 1.5 percent. In this way, the three hydroelectric power stations at Fuchun Jiang, Xijin, and Qingtongxia (with total installed capacity of 800,000 kilowatts and an annual output of 3.3 billion kilowatt-hours) lose 60 million to 100 million kilowatt-hours of electricity each year because of lower efficiency. The efficiency of the stroke type hydraulic turbine is also low. For example, when the hydraulic generator of the third step in Yili He has a load of over 94 percent, the actually measured efficiency is 3 to 4 percent lower than the value guaranteed by the manufacturers. Each year, the nation's hydroelectric power stations generate over 1.5 billion kilowatt-hours of electricity less because of the low efficiency of hydraulic turbines alone.

The low efficiency of hydraulic turbines worsens the conditions of waterflow, cavitation becomes serious, and repair work increases. The average damage due to cavitation of hydraulic turbines in our nation is about 10 times larger than foreign equipment. Most generators have to be shut down for major repairs after operating for 5,000 to 8,000 hours. Major repairs generally require 1.5 to 2 months (in advanced nations, the equipment undergoes major repairs every ten years or more). The interval for major repairs is short, the down time is long, and this affects normal generation of electricity. The Yuzi Xi Hydroelectric Power Station began operating in 1971. Because of

cavitation, vibration, wear caused by mud and sand and broken blades, the generator could not operate normally, and in 10 years, it lost more than 4 billion kilowatt-hours of electricity, constituting 41.7 percent of the designed output.

(V) Damming of Downstream Tailwater Level Causes Loss of Waterhead

Because of the piling of debris during construction, and because downstream construction weirs were not removed completely and because of silting, the downstream tailwater level has been dammed up, reducing the waterhead to generate electricity. For example, the actual tailwater level of the Liujiaxia Hydroelectric Power Station is 4 to 6 meters higher than the designed level (the designed syphoning height H_s = -2 meters, but the station is actually operating at -6 to -8 meters), equivalent to 4 to 6 percent of the designed waterhead of 100 meters. If the effect of the rise of the tailwater level upon the output of electricity is calculated on the basis of the output of electricity during the dry season, each year, 100 million to 150 million kilowatt-hours of electricity are lost. According to incomplete statistics, our nation's 11 large and medium hydroelectric power stations lose 290 million to 420 million kilowatt-hours of electricity each year because of the damming of tailwater, constituting 1.5 to 2.2 percent of the designed output of electricity (See Table 3).

At the site of reservoirs of some other hydroelectric power stations, evacuation of people from the reservoir areas, limitations in the elevation of railroads, defects in hydraulic structures (such as quality problems of large dams, deficient flood discharge ability, leakage) have affected the rise in the water level and forced the power stations to operate with a limited water level. At present, 17 power stations have such problems. According to estimates, they lose about 1 billion kilowatt-hours of electricity each year.

Clogging of trashracks also causes a loss of the waterhead. For example, during the water supplying period of the Qingtongxia Hydroelectric Power Station, weeds frequently clog trashracks. The maximum loss of the waterhead once reached 7.8 meters, or 43 percent of the designed waterhead. The trashracks at the Sanmenxia, Yili He, Gutian Xi, Yingxiuwan, and Xier He hydroelectric power stations have all been clogged by weeds, tree roots, roots of reeds, and floating logs. This not only caused a loss of electricity, some trashracks were even crushed and collapsed.

Table 3. Loss of electricity caused by the damming of tailwater of 11 of china's large and medium hydroelectric power stations

Item	Designed Annual Output (100 Million Kilowatt-hours)	Designed Waterhead (Meter)	Elevation of the Waterhead Level	Annual loss of output (100 Million Kilowatt hours)
Name of power station				
Liujiaxia	57	100	4-6	1.0-1.5
Gongzui	41.2	48	2-3	0.9-1.3
Zhexi	22.9	60	1-3	0.2-0.6
Fengman	18.9	65	0.5	0.08
Bikou	14.63	73	2.3	0.25
Xinfeng Jiang	11.8	73	0.55	0.02
Fuchun Jiang	9.23	14	0.5	0.05
Chencun	3.18	52	1	0.03
Shiquan	6.5	39	1	0.12
Bapanxia	11	18	0.7	0.22
Maotiaohe	2.29	35	0.5-1.7	0.04
First, second and third cascades				

(VI) Other Problems in the Operation of Power Stations

Some hydroelectric power stations do not have matching power lines, and in ordinary years, eddy currents occur. For example, Gongzui and Fengtan hydroelectric power stations each transmitted 100,000 kilowatts less because of this and lost 1.1 billion kilowatt-hours of electricity annually. Some hydroelectric power stations have generated less output because of accidents. For example, flooding of the plants occurred at Wujiangdu, Huanglongtan, Fengtan and Tianqiao. This affected the output of electricity for several months. The steel pressure pipes at the Quanshui Power Plant in Guangdong burst and the whole plant was shut down for 5 years, a loss of 560 million kilowatt-hours of electricity.

It can be seen from the above analysis that our nation's output of hydroelectricity is less than the designed output by more than 10 billion kilowatt-hours because of both objective and subjective reasons. Objectively speaking, in treating the types of problems due to a scarcity of the annual amount of water and permanent defects of hydroelectric power stations, we can only evaluate, verify and correct the designed output of electricity. Subjectively speaking, there are two types of problems. Some problems are more difficult, they involve a broad scope, they cannot be solved at once, and they require continued study in the future to solve them, such as the removal of silt of mud and sand in reservoirs; utilization of seasonal electricity; improvement of the efficiency of hydraulic turbines; treatment of local construction

defects in large dams; increasing the flood discharge capability. Other problems are those that can be quickly corrected by implementing effective measures and that can produce gains in generating electricity, for example, sölving the problem of evacuating the people inside reservoir areas to improve the operating water level; matching power lines for transmission of electricity; rational and optimal control of reservoirs; dredging the accumulation of sediments of tailwater; installing trash removal equipment for trashracks; reducing accidents involving power generating equipment. This portion involves about 5 billion kilowatts of electricity. The cost needed for technical improvements is also worthwhile. For example, if we can arrange 7,700,000 yuan to clean up the accumulated sediments of tailwater at Liujiaxia and the remaining downstream weirs, each year, we can increase 100 to 150 million kilowatt-hours of electricity. Calculating at a profit of 4 million yuan of profit per 100 million kilowatt-hours of hydroelectricity, investment can be completely recovered in two years. Upstream hydroelectric power plants have used underwater sand removers in recent years to remove the tailwater silt. Good results have been realized. In the present situation of energy shortage in our nation, efforts to study how to increase th output of hydroelectricity have a major significance in conserving coal, petroleum and easing the shortage of electric power. Therefore, we suggest the following:

1. We should conduct special research and analysis for a rational and optimal control of every large hydroelectric power station, investigate hydrological meteorology of past years, soundness of hydraulic structures and power generating equipment, the generation and supply of electricity over past years, propose plans to implement rational and optimal control, and gradually implement the plans under the unified leadership of the network bureaus. On this basis, we should summarize the dispatching experience of hydroelectric power stations in different regions, different regulatory functions, different power network structures and popularize the experience on an overall basis. We should implement the methods of encouraging network-wide conservation of coal.

2. We should appropriate a fixed amount of investment, organize construction forces to clean up accumulated sediments of tailwater. We should match the power lines of those power stations that are a hindrance to the transmission of electricity. We should arrange the evacuation of people from the reservoir areas well. We must repair local defects of hydraulic structures to improve the management level of operation and reduce accidents.

We must concretely follow the designed requirements of projects under construction, guarantee quality and quantity, the outer appearance of the project and the waterhead for the generation of electricity and output. A project must meet the designed requirements before it is delivered.

3. We must study ways to enlarge the power network and compensatory regulation of groups of power stations spanning river valleys. At the same time, we must study the establishment of enterprises that consume a lot of electricity in regions with an abundance of seasonal electricity, and implement policies to provide electricity at low prices.

We must actively propagandize and organize efforts to implement closing the mountains to cultivate forests so that there will be an abundance of forests and water in the reservoir area to control soil erosion. We should also promulgate methods to encourage efforts to close the mountains and cultivate forests.

5. We must strengthen experimental research in hydraulic turbines, guarantee the design and manufacturing quality of power generating equipment, implement a system for guaranteed returns and compensation for products. We must gradually renew and replace hydraulic turbines that have a low efficiency and that perform poorly.

9296
CSO: 4013/20

HYDROPOWER

STATUS OF BAISHAN, HONGSHI HYDROPOWER PROJECTS REPORTED

Beijing GONGREN RIBAO in Chinese 17 Nov 82 p 1

[Article: "Two New Hydropower Stations Being Built on the Songhua Jiang"]

[Text] Baishan Hydropower Station Lowers Sluice Gates, Stores Water. The Baishan Hydroelectric Power Station, the largest in northeast China, has successfully lowered its sluice gates and stored water. The Baishan Hydroelectric Power Station is on the line between Huadian and Jingyu counties on the Di'er Songhua Jiang in Jilin Province. Built principally to generate electricity, this large-scale hydropower station also brings other benefits, such as flood prevention. It will have an installed capacity of 1,500 megawatts and be constructed in four stages. The first stage entails the installation of three generators with a combined installed capacity of 900,000 kilowatts. Work on the Baishan Hydroelectric Power Station was begun in May 1975 by the First Engineering Bureau engaging more than 10,000 people. By the end of October 1982, the 670-meter-long Lanhe Dam had been completed, meeting the first-stage water storage requirements. On 15 November, concerned organs officially inspected and certified that the station was ready to lower the sluice gate and store water.

Work on Main Part of Hongshi Hydropower Station Gets Under Way

On the morning of 16 November, colored flags fluttered on both banks of the river and atop the dam situated between two mountains. Tens of thousands of people looked on as the two 200-ton sluice gates were slowly lowered into position, immediately blocking the flow of the rushing current and setting the stage for power generation in the coming year.

Some 40 kilometers downstream from the Baishan station, advantage is taken of the blocked flow to commence work on the Hongshi project, a station with an installed capacity of 200,000 kilowatts. The Hongshi hydropower station, along with the Fengman hydropower station downstream from it, will form a cascade power station complex, easing the critical situation on the northeast region's power supply and playing an important role in the economic construction of the three northeastern provinces.

CSO: 4013/80

STATUS REPORT ON YUZI XI, BIKOU HYDROELECTRIC PROJECTS

Beijing SHUILI FADIAN [WATER POWER] in Chinese, No 9, 12 Sep 82, p 47

[Article by correspondent Zhang Jihua [1728 4949 5478] in the column: "Hydroelectric Power Stations Under Construction"]

[Text] Yuzi Xi Second Cascade Hydroelectric Power Station

The Yuzi Xi is a tributary on the right bank of the upper reaches of the Min Jiang in Sichuan Province. The river is 95.4 kilometers long and the area of the river valley is 1,736 square kilometers.

The dam site of the second cascade power station on the Yuzi Xi is built at Tianzhulin about 22 kilometers from the river mouth.

The power station consists of three parts, the head project, the diversion canal, and the generator plant. The head project consists of a floodgate, a water intake structure, sand sedimentation pool, the river channel dredging project, and a diversion and sand draining tunnel. The floodgate is an open type. The maximum structural height is 31.5 meters. The total length of the top of the floodgate is 88 meters divided into 5 floodgate chambers: the portal on the left side is a sand sedimentation and diversion gate (7 meters wide, 3 meters high); another portal is the scouring gate (2.5 meters wide, 7 meters high); the three portals on the right are flood discharge gates (two of them are 7 meters wide and 7 meters high, the other is 7 meters wide and 2.5 meters high). Each floodgate chamber is 40 meters long. A sunken seam runs through the middle of the buttress of the floodgate. On the right bank are two concrete gravity dam segments (total length of 30.9 meters). Downstream from the dam floodgates is a 75-meter-long apron.

The water intake structure is on the left bank. The intake floodgate is situated on the left side upstream from the sand drainage gate. The intake structure takes in water laterally. There are a total of three portals. The No 1 portal has dimensions of 4.62 x 3.2 meters, and the No 2 and No 3 portals have dimensions of 4.62 x 3.7 meters. In front of the right buttress of the sand drainage gate is an arc water confinement wall which forms a narrow trough with the bottom ridge of the intake gate to facilitate scouring. Behind the intake gate is a sand sedimentation pool 100 meters long and 25 meters wide. On the right bank is a diversion and sand drainage tunnel of

of about 620 meters in total length used for draining sand. During construction it also serves as a diversion tunnel. The diversion and sand drainage tunnel is a square, pressure-free tunnel. The sectional dimensions are 5.6 x 7.62 meters. The maximum discharge is 363 cubic meters/second.

The diversion canal project has an intake, a diversion tunnel, a pressure adjustment well and high-pressure pipes. There are two intakes, one for the dry season and the other for the flood season. The elevation of the floors varies by 2.3 meters. The diversion tunnel is a round, pressurized tube 7,750 meters in total length. The pressure adjustment well is of the overflow differential double chamber type. The upper chamber is a cavern (of square shape, 6 x 9 meters). The verticle shaft is cylindrical (with a diameter of 6 meters) with a rectangular (4.7 x 5.8 meters) gate shaft 53 meters high. The lower chamber is circular (6 x 7.5 meters) and variably circular (diameter of 6 meters). The high-pressure pipes are inclined shafts (at an angle of inclination of 46), the inner diameter of the main pipe is 3.8 meters, the total length is 570 meters. The maximum operating waterhead of the steel pipes is 390 meters.

The plant of the hydroelectric power station is a cavern type with four 40,000-kilowatt generators installed. The total installed capacity is 160,000 kilowatts. The multiple-year average output of electricity is 890 million kilowatt-hours.

The designed total amount of work of the whole project includes: 2.4 million cubic meters of earth and rock, 320,000 cubic meters of concrete, and 3,000 tons of metallic structures. The project is designed by the Chengdu Surveying and Design Institute and constructed by the Tenth Engineering Bureau.

The preliminary design of the Yuzi Xi Second Cascade Hydroelectric Power Station was initially approved in 1977. Construction workers immediately went to the site to build access roads and preparatory work. Now, construction of the floodgate dam area, the construction tunnel for the diversion tunnel and the power plant area are under way. It is expected that the diversion and sand drainage tunnel can allow the passage of water in October 1982.

Bikou Hydroelectric Power Station

The Bikou Hydroelectric Power Station is situated on the main stream of the Bailong Jiang, a tributary of the Jialing Jiang in Wenxian, Gansu Province. It is about 3 kilometers from the town of Bikou. The main project of the power station includes the dam, the spillway, flood discharge tunnel, the diversion canal for generating electricity, the pressure adjustment well, the plant of the power station and the log passageway.

The dam is a clay core earth and rock filled dam. The maximum dam height is 101 meters, the top of the dam is 8 meters wide, the maximum bottom width is about 500 meters. The total length of the top of the dam is 297.36 meters. The base rock of the large dam is an intercalation of seriate quartz-phyllite and metamorphic tuff. The riverbed covering layer has a maximum thickness of

34 meters. The dam uses two concrete anti-seepage walls of 1.3 meters wide and 0.8 meters wide. A grouting curtain is used to prevent leakage.

The spillway is a bank-side open type on the right bank. Ridges separate the flow to dissipate energy. The full length is 393 meters, the designed discharge is 1,330 cubic meters/second (the verified discharge is 2,310 cubic meters/second). There is a 15 x 15-meter arc floodgate which is opened and closed by a 2 x 80-ton fixed gate operating mechanism.

The flood discharge tunnel is on the right bank. There are deep shafts as water intake mouths. The pressurized segment is round with a diameter of 10.5 meters. The pressure-less segment is a portal with dimensions of 10 x 12 meters. The designated discharge is 1,620 cubic meters/second. The total length of the tunnel is 763.4 meters. It uses ridges to dissipate energy.

On the left bank is a 630-meter long sand drainage tunnel. The designed discharge is 285 cubic meters/second. The maximum speed of flow is 23.5 meters/second.

The plant of the hydroelectric power station is on the right bank. The water intake mouth is designed as a deep shaft, pressurized wall-type intake mouth. The diversion canal is a round pressurized tunnel with a diameter of 10.5 meters and a total length of 444.13 meters. The pressure regulating well is an underground rectangular impeding type. The plant for generating electricity is a ground surface enclosed plant with three 100,000 kilowatt generators installed. The total installed capacity is 300,000 kilowatts. The annual average output is 1.463 billion kilowatt-hours.

To facilitate the passage of logs, on the right bank of the dam is a longitudinal log conveyor (of total length of 419.95 meters). The annual average amount of logs conveyed is 500,000 cubic meters.

After completion of the main project, a reservoir with a capacity of nearly 521 million cubic meters will be formed. The annual average output of electricity is about 1,463 kilowatt-hours. After the reservoir is formed, it can produce 300 tons of fish annually and irrigate 8,860 mu of farmland.

The Bikou Hydroelectric Power Station was designed by the Northwest Surveying and Design Institute of the Ministry of Water Conservancy and Electric Power and is constructed by the Fifth Hydroelectric Engineeging Bureau of the Ministry of Water Conservancy and Electric Power. The Fifth Hydroelectric Bureau staff began preparations in 1967 for construction. In 1969, construction of the main project began. The first generator already began production in March 1976. In 1977, the three generators joined the network and finishing projects are being constructed. The power station is expected to be officially inspected and delivered at the end of 1982.

9296
CSO: 4013/20

STATUS REPORT ON TAIPINGWAN, XIER HE HYDROELECTRIC PROJECTS

Beijing SHUILI FADIAN [WATER POWER] in Chinese, No 10, 12 Oct 82, p 48

[Article by special correspondent Zhang Jihua [1728 4949 5478] in the column: "Hydroelectric Power Stations Under Construction"]

[Text] Taipingwan Hydroelectric Power Station

The Taipingwan Hydroelectric Power Station is a station built with joint investment by China and Korea. It is one of the cascade hydroelectric power stations in the lower reaches of the main trunk of the Yalu River. It is situated in Taipingwan, Kuandian County, Liaoning Province (the Korean side of the project lies in Pangsanli in Sakju Prefecture in North Pyongan Province, North Korea). The dam site is 29 kilometers from the Shuifeng [Supung] Hydroelectric Power Station upstream and about 40 kilometers from Dandong City downstream. The Chinese are in charge of designing the power station with coordinated efforts by the Koreans. Construction is being carried out by the Chinese.

The area of the river valley above the dam site of the Taipingwan Hydroelectric Power Station is 53,576 square kilometers. The average flow over many years is about 800 cubic meters/second. Because the area of the river valley controlled by the upstream Shuifeng Power Plant is about 52,912 square kilometers, the Taipingwan Hydroelectric Power Station is regulated to a large degree by the Shuifeng Reservoir. Therefore, the whole power plant can generate electricity throughout the year in a more stable manner.

The main project of the power station includes the water blocking dam, the spillway dam, the riverbed plant and the substation. The dam is a concrete gravity dam. The top of the dam is 1,153.5 meters long divided into 59 sections. The two banks of the dams are non-overflow dams. There are 28 spillway holes on the 479-meter long section of the spillway dam at the center of the riverbed and on part of the beach on the left side. Arc floodgates 14 meters wide and 13.6 meters high are being built. The riverbed power plant is on the right bank inside China. It is 159 meters long (the installation room is 43 meters long). The foundation is 71.25 meters wide and 62.6 meters high. The plant houses four generators with single unit capacity of 47,500 kilowatts, totaling 190,000 kilowatts. The generators are divided into 50 cycle generators and 60 cycle generators separately transmitting electricity

to China and Korea. Annual output of electricity is about 770 million kilowatt-hours. To avoid the four generators from generating electricity simultaneously and damming water downstream and thus bring about a loss of the waterhead, it was decided after model tests to dig a trailwater canal 800 meters long with a bottom 200 meters wide and 3.5 to 4.0 meters deep.

On top of the dam is a 10-ton portal crane used to lift logs over the dam. The substation is situated at the mouth of the canal on the right side downstream from the power station. There are two circuits, one of 66 kilovolts and the other of 220 kilovolts separately transmitting electricity to China and Korea.

The major engineering figures for this project are: digging 3,560,000 cubic meters of soil and rock, pouring 850,000 cubic meters of concrete, installing about 16,000 tons of machinery and electrical equipment and metallic structures. The project was designed by the Northeast Surveying and Design Institute and constructed by the Sixth Engineering Bureau.

Because the dam of the hydroelectric power station extends a relatively long distance and because there is a wide beach on the Korean side, therefore, the system for sand and rock materials, the mixing of concrete and its system and auxiliary enterprises are established on both banks. In consideration of the large amount of construction, relatively high level mechanized construction must be utilized. Now, preparatory work for construction is basically in order, and the first phase of the main construction projects on the left and right banks is expected to begin full operation by the end of 1982.

Xier He Third Cascade Hydroelectric Power Station

The Xier He is situated in Xiaguan, Yunnan Province. Plans for the river valley call for four cascade stations. The first, second and fourth cascade stations have already been completed and have begun operation. The third cascade is the last step. The total installed capacity of the four steps is 255,000 kilowatts. The installed capacity of the third step is 50,000 kilowatts (2 x 25,000 kilowatts). The average output of electricity over many years will be 212 million kilowatt-hours.

The third cascade power station is a river blocking dam. The left bank is a waste rock pile serving as a supporting wall. The center is a concrete gravity dam. The highest dam height is 20.7 meters. The total length of the top of the dam is 124 meters. There are two flood discharge and scouring floodgates 5 meters wide and 3.5 meters high at the center of the large dam. Above the flood discharge and scouring floodgates are surface drainage spillways. The total amount of flood discharge of the river blocking dam is 581 cubic meters/second. It can withstand and safely discharge major floods occuring every 200 years (a flow of 560 cubic meters/second).

The intake of the power station is on the right bank in front of the dam. It is closely connected to the body of the river blocking dam. There is one flat plate floodgate of 3.5 meters wide and 4.3 meters tall. Including the gradually variable section, it is 21.47 meters in total length. There is no open

canal in front of the intake connecting it to the tailwater of the second cascade power station. This guarantees that when the reservoir is emptied to scour the sand, the power station could still generate power normally.

The diversion tunnel of the third cascade power station is circular. Its inner diameter is 4.3 meters. It can bear on internal water pressure of 1.3 to 4.4 kilograms/square centimeters. The maximum speed of flow is 3.78 meters/second. The main section of the diversion tunnel is 3,237.2 meters. To hasten the speed of construction, three auxiliary tunnels for construction (total length of 1,034 meters) have been built. At the end of the diversion tunnel is a pressure regulating well with an upper chamber. The shaft is 41 meters high, the inner diameter is 9.5 meters, both lined with reinforced concrete. Behind the pressure regulating well is a pressure pipeline totaling 947 meters long, 630 meters of which are ground surface exposed pipelines. The diameter of the steel pipe is 4.0 meters.

The third cascade power station is designed by the Kunming Surveying and Design Institute and constructed by the Fourteenth Engineering Bureau. At present, the concrete system of the top part and the air compression system have been completed and have begun production. Work has started on digging the auxiliary tunnel of the diversion tunnel. The connecting canal at the top has already been dug and concrete pouring has officially begun. The digging of the 272-meter exposed diversion canal has already been completed. It is expected that interception of flow can be done by the end of this year and main construction can begin.

9296
CSO: 4013/22

HU YAOBANG OFFERS FRESH IDEAS ON BUILDING HUGE SICHUAN HYDROPOWER BASE

Chengdu SICHUAN RIBAO in Chinese 9 Oct 82 pp 1,2

[Article by Liu Zongtang [0491 1350 2768] and Li Zhongpu [2621 0022 3877] of "Hu Yaobang Inspects Hydropower Projects in Dukou and Liangshan Yi Autonomous Prefecture"]

[Excerpts] The historical 12th Party Congress has just concluded. On 18 September the newspapers reported that Secretary-General Hu Yaobang of the Party Central Committee had just given an elaborate welcome to President Kim [of North Korea] in the brightly lit Great Hall of the People in Beijing on the previous night. But in the early morning of the 19th, Comrade Hu Yaobang appeared at the Tongzilin train station amid rugged mountains on the Chengdu-Kunming railroad. This area is an important energy, steel, forestry and livestock base in southwest China. Comrade Yaobang had come here to inspect the Tongzilin and Ertan hydropower stations which are in the survey and design stage.

The appearance of Comrade Hu Yaobang surprised the cadres and people here and even we reporters had not expected him. Who would have thought of that, before some of the representatives attending the 12th Party Congress had even had time to return to their posts, Comrade Yaobang would find time to travel around the clock to this remote region for an inspection? He flew to Chengdu at noon of 18 September and then took the southbound train. Once on the train, he was busy conferring with the Provincial Party Committee, leading cadres of the Chengdu Railway Bureau and other experts and listening to their briefings. He also asked the train to stop for inspections of industrial and transportation facilities along the route, including the Gongzui Hydropower Plant, Guancunba tunnel and Liziyida railroad bridge that was collapsed by mud and rock slides last year. In the evening of the 18th, after a busy day, Comrade Yaobang rested only 4 hours on the train parked at Xichang Station before he continued with his journey.

After Comrade Hu Yaobang stepped off the train at Tongzilin Station, he inquired among the welcoming party how many leading comrades from central departments have been here. Told that many central leading comrades had visited here, he beamed with a pleased smile. Eighteen years ago, in that

unforgettable era, national leaders Li Fuchun [2621 1381 2504], He Long [6320 7893], Deng Xiaoping [6772 1420 1627], Peng Zhen [1756 4176] and others had visited this sparsely populated area one after another to inspect the plant site of the Pangang base and to evaluate construction projects. Comrade Yaobang remarked that their spirit is something we should respect and learn from. At a time when we are trying to thoroughly carry out the spirit of the 12th Party Congress, their kind of work style is particularly worthy for us to carry on and to foster. In one conversation he asked Secretary Yang Rudai [2799 3067 1486] of the Provincial Party Standing Committee who was accompanying the inspection: "How many places have you been in Sichuan?" "I have been to all 188 counties and towns in Sichuan, except the border areas of a few counties like Chengkou, Wanyuan, and Ganze and Aba Tibetan Autonomous Prefecture, "Yang replied. According to Comrade Yaobang, he has visited a number of places in Sichuan since the liberation and so far there are four areas he has not visited which he plans to visit one by one in the future and he plans to cover all the areas in China in the next few years. He advised the group that cadres in leadership positions should get out more often and that some of today's leaders in charge of major projects make decisions and plans without on-site inspections, this kind of work style can be very damaging and should be corrected right away.

Comrade Hu Yaobang has provided us with an example in this regard. Walking along the Yalong Jiang and inspecting the Tongzilin and Ertan hydropower stations, he picked a rock to sit down on and told cadres and engineering personnel planning the hydropower projects: "Let us have a meeting here and plan the hydropower construction together." Everybody sat down on the ground around some drawings in front of him and joined in the discussion of problems in the construction program. This scene before us vividly reflected the profound changes in the party's leadership style.

Such changes also manifested themselves in small details. In the course of Comrade Yaobang's inspection, even though a sleeper car was prepared for him, he never used it. Instead, he rode in the passenger train with everyone else. In the tightly scheduled visits and inspections, he often gave up his afternoon break and insisted on working. When he visited the Pangang base under the hot sun, someone brought him a straw hat. "Haven't you had enough hats in the past?" he punned. People around him burst into laughter.

People also noticed such changes in the leading comrades who accompanied Comrade Yaobang on his trip. These are Secretary Hu Qili [5170 0796 4539] of the Party Central Committee Secretariat, deputy secretary Hao Jianxiu [6787 1696 4423], Central Committee member and deputy director of the Central Staff Office Yang Dezhong [2799 1795 0022], and Central Committee member and first vice-minister of the Ministry of Water Conservancy and Electric Power Li Ming [7812 2494]. They are all new members elected at the 12th Party Congress, young and competent, full of vigor and energy and displayed a brand new style. They dressed unostentatiously and were very approachable, they often got squeezed out to the back of the crowd and an

outsider could hardly tell that they were high-level cadres with heavy responsibilities. But by listening to them in some of the discussion sessions, one quickly realized that these are experts in their fields with a wealth of special knowledge and high leadership ability.

The planned Tongzilin and Ertan hydropower plants bridge the Yalong River, a turbulant, rumbling, wild river in the mountains stretching out to a 1500-kilometer length that rivals the Jinsha and Dadu rivers flowing through this region. These three rivers cover an area of 180,000 square kilometers and contain the richest hydropower reserve in China; there are not many like them in the world. Surveys show that there are 60 million kilowatts of hydropower in this area that can be developed--two-thirds of the total exploitable hydropower in Sichuan--and many cascade power stations can be built here. The installed capacity of the Ertan power plant alone will be 3 million kilowatts, more than one-third of the current total hydropower capacity in Sichuan. When this power plant is finished, it will not only satisfy the future power needs of the nearby Panzhihua steel base but also supply electric power to Chengdu, Chongqing and the neighboring provinces. It will be a hydropower plant with the tallest dam and the largest capacity in China. Its dam will be 240 meters tall, the third tallest concrete dam in the world. But this naturally endowed power station of great resources has been worked on for a whole decade since the survey and design phase began in 1972 and today there is not even a preliminary design. Many vital questions regarding the power plant construction such as capital, equipment and material, the arrangement of technological and labor forces and when to begin the construction are still unanswered and must be decided quickly.

Comrade Yaobang investigated the situation carefully and discussed it with cadres and technical staff on the scene. He noticed one significant thing, that is, when some comrades plan the project, their focus of attention is only on the dollar figure and the two important factors of material and labor forces are overlooked. Today, large quantities of construction material and equipment lie idle in warehouses all over the place, large numbers of workers are idle without assignment and keep on receiving pay in many enterprises that lack capital construction or production assignments. If these factors are not taken into account and projects are designed only the basis of the dollar amount, the safety margin is pushed way high, budgets are greatly exaggerated, requests made to the administration are totally unreasonable, this would only cause indecision by the administration and the projects will be delayed repeatedly. He said that this kind of "renminbi takes the lead" work style is going nowhere. When we work on the sixth and seventh five-year plans, we must consider the three factors of human, monetary and material resources, otherwise we can never achieve sound and rapid results with less expenses.

At this point, Comrade Yaobang particularly mentioned a conversation with Comrade Kim Il-song 2 days before. Comrade Kim told him that Korea plans to reclaim 500,000 hectares of coastal land in the next few years and the approach will be assigning the job to the people's army and let them work on 20,000 hectares a year without paying them one cent; because

they don't need any money to blast rocks, all it takes is some dynamite and picks, which the people's army already have. We have used the method of the Koreans in the past with good results. Today we have a large number of army capital construction engineers and local capital construction crews that are idle without assignment. Why not mobilize them to do the job? He suggested that we might contract the job with the People's Liberation Army or send the job to other provinces for bids and give the assignment to whoever submits the lowest bid.

These remarks of Comrade Yaobang really livened up the discussion and had people's ideas going. Old engineer Li Mingxin [2621 2494 9515] said with a big smile that in the past we have always done things by following the old groove and made every plan according to the money available, when the state had financial difficulty, many projects did not go well; and now the state has great quantities of materials in store and a strong construction team to do the job, many projects can still go forward even without too much money. This old engineer long devoted to survey and design has conducted survey section by section along the Yalong Jiang and is very familiar with the topography, geomophology and geological structure of the area. But in the past his heart sank when he thought about the billions of yuan it would take to construct the Ertan Hydropower Plant, the state has many projects to take care of, when will this huge sum of investment capital become available? Now, after hearing the analysis by Comrade Yaobang and realizing the favorable conditions we already have, his confidence was suddenly strengthened and he no longer felt the beginning of construction to be that far away. He strongly recommended that from now on we speed up survey and design work.

Comrade Hu Yaobang is paying great attention to this project and has studied it with the associated departments in Beijing on many occasions. Now he has investigated the dam site in person, evaluated design proposals, discussed the situation with cadres and specialists, heard different opinions and obtained first-hand data. He then integrated the useful suggestions, made the necessary decisions and wrote a report to the Central Committee recommending that a feasibility design of Ertan hydropower plant be made as soon as possible to prepare for the construction work.

Stimulated by the spirit of the 12th Party Congress, the Ertan hydroelectric power project, after repeated delays and anxiously awaited by the people of Sichuan, will begin its construction work before long.

9698
CSO: 4013/44

WAYS TO GET MORE FROM HYDROPOWER STATIONS IN WINTER STUDIED

Beijing SHUILI SHUIDIAN JISHU [WATER CONSERVATION AND HYDROELECTRIC POWER TECHNOLOGY] in Chinese, No 7, 20 July 82, pp 62-63

[Article by Ren Dingying [0117 0002 6892] of the Xiangshui Power Station, Hengshan County, Shaanxi Province: "Measures To Generate More Electricity by the Xiangshui Power Station in Northern Shaanxi in Winter"]

[Text] In the northern part of our nation, small runoff type hydroelectric power stations generally are plagued by the problem of not generating electricity or generating less electricity in winter. The Xiangshui Power Station is such a typical small hydroelectric power station. It is situated at the southern edge of the Maowusu Desert in northwestern Shaanxi on the Wuding He. Its total installed capacity is 3,600 kilowatts. The lowest temperature in winter reaches -29° C here, and generally it is between -15 and -24° C. Temperatures below 0° C last for about 90 days. Therefore in winter, in the diversion canals, there are slushy ice deposits and the water surface freezes, the forebay is jammed by ice and the floodgates freeze. This frequently forces the power station to shut down and cease generating electricity, and has created many difficulties for the power station after it began production on 15 October 1974. To generate more electricity in winter, we rebuilt part of the project and improved management. In the winters of 1979, 1980 and 1981 (from December to the following February), the number of hours of power generation were respectively 1,538, 1,962, 1,927 and the output of electricity was respectively 2,058,000, 3,065,000, 2,917,000 kilowatt-hours, and good results were obtained. We will present our experience here for reference.

(I) Rebuilding the Overflow Weir and the Trash Rack of the Pressure Forebay To Facilitate Ice Drainage

During the early part of winter when there is a lot of floating ice and at the beginning of spring when the ice melts, large amounts of ice must pass through the forebay to be drained, but the originally designed overflow weir, ice draining trough and trash rack caused difficulties in the smooth draining of ice. It can be seen from the diagram that the originally designed water draining through was only 1.5 meters wide. Large blocks of ice could not be drained, the ice inside the trough easily

plugged the outlet, and the wall of the trough easily froze. The trash rack was originally at the back of the funnel-shaped water intake section. The front part of the trash rack accumulated ice which could not be easily drained away be water and had to be removed manually. The original overflow weir was 14.0 meters long. The overflow direction and the diversion canal formed a 90° angle. This hindered the draining of ice and a lot of water had to be used to drain the ice.

To improve the conditions for draining ice from the forebay, a new overflow weir of 5.0 meters wide was added to the top of the two-holed sand drawing sluice gate. The top of the weir was 0.5 meters lower than the top of the original overflow weir. The gate control screw rod of the sand draining sluice gate was protected by a steel sleeve. The hole of the sluice gate was sealed by steel plates at the slope of the overflow dam where water retreated. This made the ice draining direction and the direction of the canal consistent and made it easy to drain ice. It can also reduce the amount of water used for draining the ice and increase the amount of water to generate electricity. In 1980, the trash rack was moved from the back of the funnel-shaped water intake to the front. The ice lingering in the funnel-shaped intake section was partly blocked by the trash rack. They could be directly drained from the new spillway and the scouring sluice, and the rest of the ice could be channeled through the trash rack into the diversion pressure steel pipes and released.

The newly built overflow weir also solved the problem of ice freezing the scouring sluice. The scouring sluice not only drained silting sand in the forebay, it also controlled the amount of water for generating electricity and guaranteed the safety of the generators under normal conditions. It also controlled the water level to facilitate the discharge of ice. Therefore, whether the scouring sluice could operate in a versatile manner was a necessary condition for the safe operation of the power station. But in severely cold weather, water leaking from the scouring sluice gate became ice, freezing the sluice gate and the sluice gate through together, making it difficult to open and close the sluice gate. After building the new overflow weir, the overflow to drain ice separated the sluice gate from the cold air, raised the temperature of the scouring tunnel, and during operation in the winters of 1977-1981, the scouring sluice gate could be opened and closed easily. In addition, when necessary, heating devices could also be installed inside the scouring tunnel.

At the beginning of winter here, slushy ice gradually forms in the river and lasts for 15 to 20 days. After the surface of the river freezes, the slushy ice begins to melt when water flowed downward from the layer of ice. Large amounts of slushy ice are carried by water into the forebay and remain there, blocking the sewage blocking grid and even plugging the steel diversion pressure pipes. Before building the new overflow weir in 1977, each year at the beginning of winter, when ice was present, the power station ceased to generate electricity for more than 10 days. After the new overflow weir was completed, the interruption was shortened to some 50 hours. After the position of the trash rack was moved, operation

during the winters of 1980 and 1981 showed that the results were good and the problem of manual removal of accumulated ice was solved.

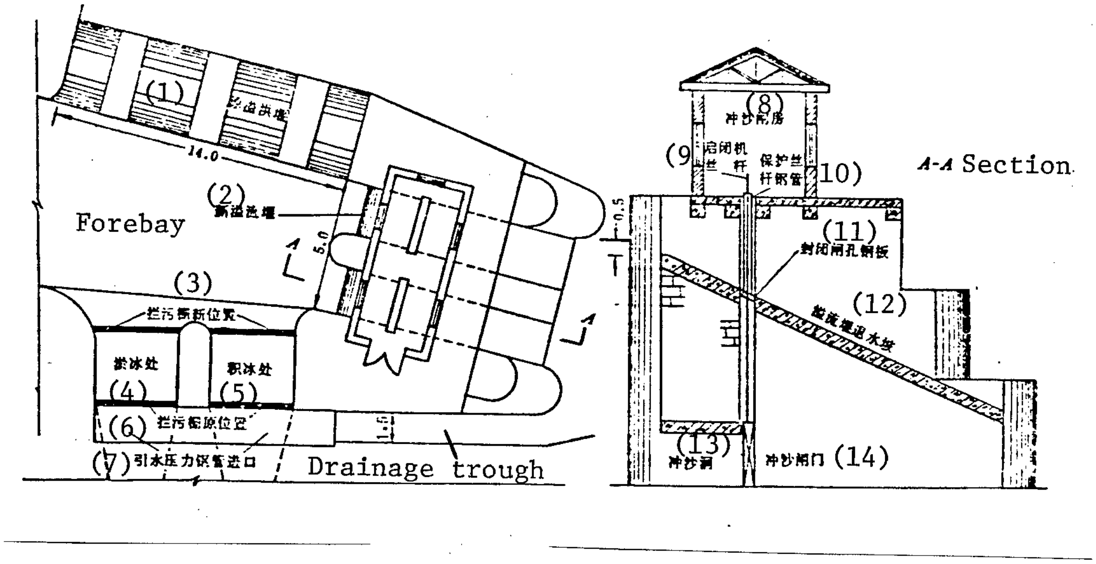
(II) Strengthening the Shifts To Oversee the Forebay, Guaranteeing Immediate Drainage of Ice

After the trash rack was moved to the front of the funnel-shaped water intake section in 1980, shifts to oversee the forebay were strengthened. The guards could communicate with the persons on duty inside the plant at any time. When there was less water in the river, they guaranteed the use of a fixed amount of water to drain ice. Whatever load could be drained was drained and thus the duration of shutdown in the generation of electricity was further reduced to about 20 hours. But one aspect must be especially noted, that is that when the load is small (several hundred kilowatts or modulated phase operation) and when the slushy ice is plentiful, the generator must be immediately shut off to drain the ice. To prevent plugging the steel diversion pressure pipes, the generator cannot be forced to operate. Because when the generator is operating when there is a lot of slushy ice and when the load is small, the opening of the blades of the water turbine is very small, and water will flow through the gaps between the blades before all the ice has passed through, more and more slushy ice will accumulate and finally the steel diversion pressure pipes will be plugged. For example, on 19 November 1981, the atmospheric temperature suddenly dropped, the amount of slush ice in the river increased while the flow was very small. After using a fixed amount of water to drain the ice, the load of the generator was very small. Later, during modulated phase operation, all of the steel diversion pressure pipes were plugged by slushy ice after only 8 hours. At the time, the highest water level of the forebay was utilized and the guide blades of the water turbine were all opened up. It took over 10 hours to wash away the ice accumulated inside the diversion pressure pipes.

(III) Keeping the Water Level in the Forebay Stable, Reducing the Formation of Ice in the Canal

The amount of flow in the diversion canal of the power station was 17.5 cubic meters/second. It was 2,107 meters long. The length of the rectangular section of the canal was 1,307 meters long, 4.5 meters wide and 4.0 meters deep. The length of the stepped section of the canal was 800 meters long, the top opening was 10.0 meters wide, the bottom was 2.0 meters wide, and the depth was 4.0 meters. Over the past several years, the most severe winter freeze occurred in 1976 and 1979. In the rectangular section of the canal, the width of the ice on the southern bank was 1.6 meters and the width of the ice on the northern bank was 1.2 meters. In the stepped section of the canal, the width of the ice on the southern bank was 2.0 meters and the width of the ice on the northern bank was 1.6 meters. A lot of ice formed in the canal during winter and the section for water flow was reduced, the water level rose and water spilled over the two banks, seriously threatening the safety of the canal. At the beginning of spring when the ice melts, blocks of ice 10.0 meters long, 2.0 meters wide and 1.0 meters thick that slide down from the two banks of

Diagram of forebay of Xiangshui Power Station



KEY:
(1) Original spillway weir
(2) New spillway weir
(3) New position of trash rack
(4) Ice silting area
(5) Ice accumulation area
(6) Original position of trash rack
(7) Steel diversion pressure pipe intake
(8) Scouring sluice
(9) Screw rod of gate control
(10) Protective screw rod steel pipe
(11) Steel plate of sealed sluice gate hole
(12) Water retreating slope of overflow weir
(13) Scouring tunnel
(14) Scouring sluice gate

the canal are very difficult to remove from the forebay and have created difficulty for the safe operation of the power station. In the winter of 1976, the station ceased generating electricity for 2 months and in 1979, the station ceased generating electricity for 20 days. According to operations during severely cold weather, whenever the water level in the canal rises and falls once, a layer of ice will be formed on the two banks. The closer to the forebay, the thicker and wider ice. In the winter of 1979, the generator was shut off to allow the water to retreat and the ice had to be shoveled more often. After the power station joined the power network, the load increased, the water level changed frequently, and therefore the most amount of ice formed in the canal. In 1980, the water level in the canal was relatively stable on the basis of the pattern of freezing, and the generator ceased to generate electricity fewer times to allow water to retreat. During the winter of that year, the least amount of ice was formed, the time without generating electricity was the shortest, and the most amount of output of electricity was generated.

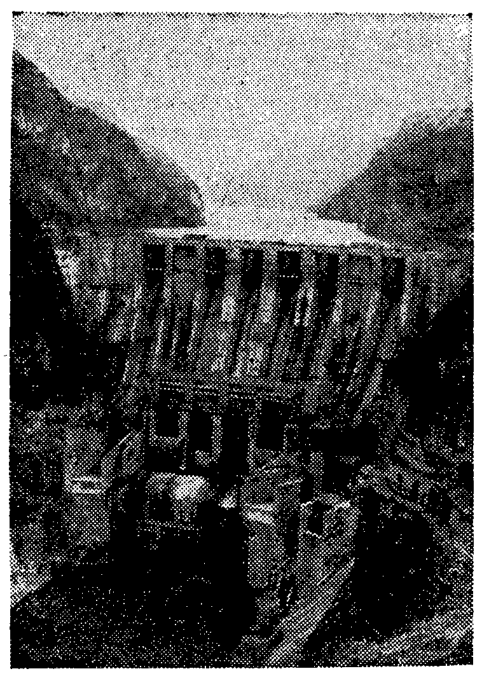
9296
CSO: 4013/137

HYDROPOWER

WUJIANGDU POWER STATION COMPLETES TESTS, JOINS GRID

Hangzhou ZHEJIANG RIBAO in Chinese 8 Dec 82 p 3

[Photograph and caption]



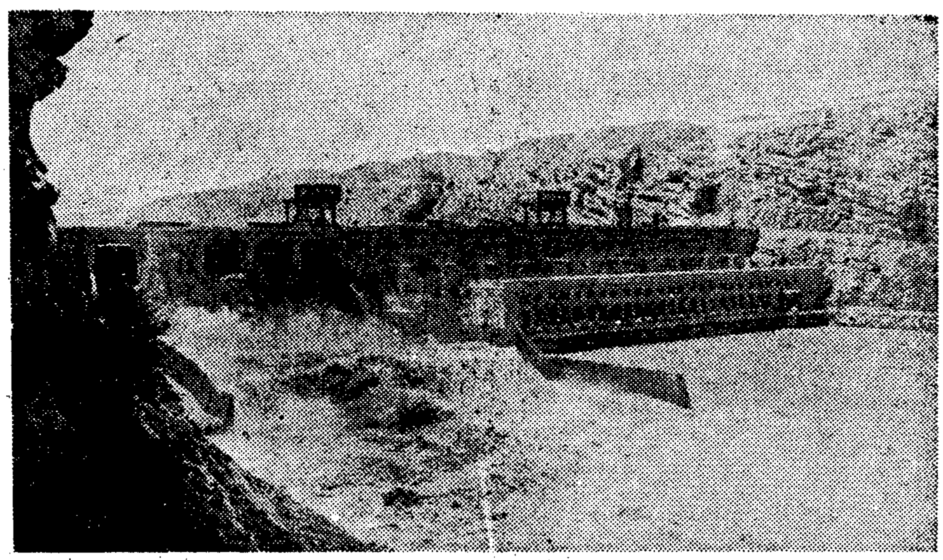
Construction of the Wujiangdu Hydroelectric Power Station has been completely finished and it has joined the grid following a 72-hour test run. This large-scale hydropower station, built on the natural barrier of the Wu Jiang in Guizhou Province, has a total installed capacity of 630,000 kilowatts and will supply power to the two provinces of Guizhou and Sichuan for industrial and agricultural production and for the people's livelihood. Shown in the photo is the main dam of the hydropower station.

CSO: 4013/81

GANSU EXCEEDS YEARLY HYDROPOWER OUTPUT PLAN

Lanzhou GANSU RIBAO in Chinese 11 Nov 82 p 1

[Text] As of 5 November, the Gansu hydropower industry had completed the 1982 hydropower output plan of 8.2 billion kwh 56 days ahead of schedule. As of the 10th, the plan had been exceeded by 138 million kwh, 21.82 percent more than the corresponding period of 1981.



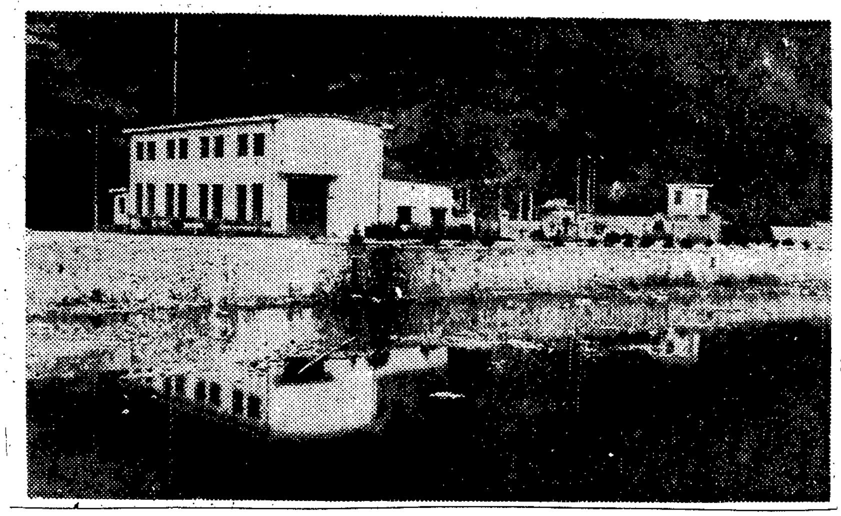
Exterior view of the Yanguoxia Hydroelectric Power Station, Gansu Province.

CSO: 4013/80

ZHEJIANG'S CHANGZHAO RESERVOIR SPAWNS BATCH OF SMALL HYDROPOWER STATIONS

Hangzhou ZHEJIANG RIBAO in Chinese 30 Oct 82 p 1

[Photograph and caption]



Xinchang County is making maximum use of the water in the Changzhao Reservoir to construct five hydroelectric power stations with a total installed capacity of 12,000 kilowatts. Pictured is the first-stage Changzhao Power Station with an installed capacity of 6000 kilowatts.

CSO: 4013/80

HYDROPOWER

MEIXIAN IS MODEL OF SMALL-SCALE HYDROPOWER UTILIZATION

Guangzhou NANFANG RIBAO in Chinese 20 Oct 82 p 1

[Text] Since 1979, the capacity of small-scale hydropower installation in the Meixian region had increased by 48,700 kw, which was almost equal to the total capacity installed during the past decade. At present, a total of 2,220 small-scale hydropower plants have been built; the total capacity has reached 134,700 kw, and the annual generated power exceeds 300 million degrees.

The Meixian region is rich in natural hydropower resources. Since the Third Congress of the Central Committee, government officials have devoted their attention to the exploitation of the natural resources in this region, and in particular have recognized the important effect of small-scale hydropower on the economy of the mountainous region. In the process of developing small-scale hydropower, the government established a policy of providing full support to civilian-initiated projects. If a commune has abundant hydropower and is capable of generating its own electricity, the government would provide the necessary loans as well as the proper assistance. The Department of Hydropower had organized a technical task force to conduct surveys and establish plans for more than 50 rivers in the region; significant efforts have also been devoted to the construction methods of power stations in order to minimize investment, and to achieve immediate and large payoff. This motivated the counties and commune brigades to join forces in the common task of power generation.

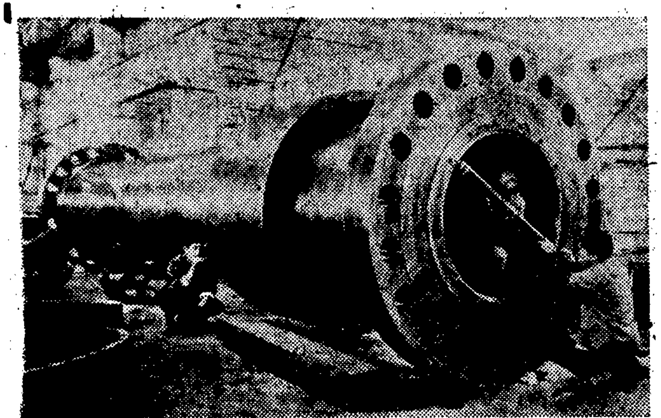
In order to improve the economic benefits and quality of small-scale hydropower, the Meixian region not only accelerated the construction of power stations, but also devoted significant efforts to the installation of a small-scale hydropower network. The Department of Hydropower provided both technical and financial support to all small-scale power stations which had requested to join the network. Over the past 3 years, over 1,800 km of new 35-kw and 10-kw high voltage transmission lines have been installed. Once the small-scale hydropower network is connected to the national network, the Department of Small-Scale Hydropower will derive sufficient benefits from both to ensure continued development of small-scale hydropower.

3012
CSO: 4013/61

SICHUAN PLANT READIES BIG GENERATORS FOR LONGYANGXIA HYDROPOWER STATION

Guangzhou NANFANG RIBAO in Chinese 12 Dec 82 p 3

[Photograph and caption]



The staff and workers of the Sichuan Electrical Machinery Plant have made a 320,000-kilowatt hydraulic generator for the Longyangxia Hydroelectric Power Station. The generator is currently the largest single generator in terms of installed capacity in China. Shown in the photograph are workers and technicians inspecting the generator's main shaft.

CSO: 4013/83

BRIEFS

WORK RESUMED ON TIANSHENGQIAO--Work has been officially resumed on the Tianshengqiao Hydroelectric Power Station on the Nanpan Jiang. The power station is situated on the lower reaches of the Nanpan Jiang, a river on the border between the provinces of Guizhou and Guangxi, and currently one of the large-scale hydropower projects under construction in China. A project that had been postponed, the Tianshengqiao power stations are to be built in two stages. These two stages will have a total installed capacity of 2,400,000 kilowatts and an annual power output of 13.5 billion kwh. The decision to resume construction was dictated by the power needs of south China. [Text] [Hangzhou ZHEJIANG RIBAO in Chinese 24 Oct 82 p 3]

NORTHWEST HYDROPOWER OUTPUT UP--Through October, six hydroelectric power stations in the northwest had generated 1.320 billion kwh more than in the corresponding period of 1981. These six power stations, subordinate to the Northwest Power Industry Management Bureau, have been able to generate more power, bringing about a reduction in thermal power generation and saving a total of 770,000 tons of coal. [Text] [Fuzhou FUJIAN RIBAO in Chinese 9 Nov 82 p 3]

LIUJIAXIA EXCEEDS ANNUAL PLAN--Taking advantage of this year's more abundant water supply, the Liujiaxia Hydroelectric Power Station has done everything possible to generate the maximum amount of electricity. Up to 26 October, the annual power generation plan of 4.5 billion kwh had been achieved 66 days ahead of schedule. This is 800 million kwh more than the corresponding period of 1981 and represents an increase in output value of 52 million yuan. Since April of this year, there has been a steadily rising flow of water in the upper reaches of the Liujiaxia reservoir. The station has conducted checks and preventive tests on the equipment ot assure that each generator produces power in a complete and stable manner during the high-water [flood] season. Inspired by the 12th Party Congress, the station's personnel have broken the daily and monthly records for power output. [Text] [Lanzhou GANSU RIBAO in Chinese 30 Oct 82 p 1]

ZHEJIANG SMALL-SCALE HYDROPOWER--The Tiantai Power Company is making maximum use of the county's water power resources, tapping unused potential to achieve outstanding results. Up to the end of October, the original 10 small stations that had been merged with the grid had grown to more than 20 with a total installed capacity of close to 20,000 kilowatts capable of supplying more than

51 million kwh, not only satisfying the county's power demand for industrial and agricultural production, but also helping the state save more than 75,000 tons of coal. The majority of the small-scale hydropower stations in the county are not interconnected; some have no means to transmit surplus power while others cannot be sufficiently utilized during dry spells. In order to resolve these contradictions, the Tiantai Electric Power Company is steadily expanding its small hydropower network and concentrating its dispersed surplus power, achieving mutual distribution of the power from each small hydropower station. As of October 1982, in addition to supplying more than 17 million kwh to the county, more than 28 million kwh were made available to the East China Grid. [Text] [Hangzhou ZHEJIANG RIBAO in Chinese 18 Nov 82 p 1]

WORK BEGINS ON TAIPINGWAN--On 27 October, ground was broken on the Taipingwan Hydroelectric Power Station on the Yalu Jiang, a joint construction project undertaken by China and the Democratic People's Republic of Korea. This is the fourth hydropower station construction project on the Yalu Jiang to be tackled by the two countries. This hydropower station in situated on the lower reaches of the Yalu Jiang, forty kilometers from Dandong City. Major parts of the project include a retaining dam, a spillway dam, a powerhouse and a transformer station. The main dam is 31.5 meters high and 1,149 meters long, one of China's longest dams for similar hydropower stations. The total installed capacity is 190,000 kilowatts with an annual power output of 7.7 billion kwh. The project is being undertaken by the Sixth Engineering Bureau of the Ministry of Water Conservancy and Eelctric Power. [Text] [Shenyang LIAONING RIBAO in Chinese 5 Nov 82 p 1]

CSO: 4013/83

WUJIANGDU NOW FULLY OPERATIONAL--Another of China's large-scale hydropower stations--the Wujiangdu Hydroelectric Power Station--has been completed. Following a 72-hour test run, the station officially joined the power network. The Wujiangdu power station has three generators, each with an installed capacity of 210,000 kilowatts. The No 3 generator has been recently installed and adjusted; the No 1 and No 2 generators were installed in 1979 and 1981 respectively. The completion of this hydropower station, with a total installed capacity of 630,000 kilowatts, will increase Guizhou's power generating capacity by about two-fifths. Its electricity will be fed into the Southeast Grid with any surplus going to Sichuan. The Wujiangdu power station is located on the middle reaches of the Wu Jiang in Zunyi County, Guizhou Province in a gorge amid some of the most developed karst regions on the face of the earth. [Excerpts] [Taiyuan SHANXI RIBAO in Chinese 9 Dec 82 p 3]

CSO: 4013/85

STATUS, PROBLEMS OF HEAT, POWER COGENERATION PLANTS DISCUSSED

Beijing DIANLI JISHU [ELECTRIC POWER] in Chinese No 8, 5 Aug 82, pp 25-27

[Article by Chen Kai [7115 0418] of the Planning Bureau of the Ministry of Water Conservancy and Electric Power: "Basic Status of Heat and Power Cogeneration Plants and Related Problems"]

[Text] 1. Basic status

Up to the present time, the volume of heating systems in China accounts for approximately 11 percent of its thermal power capacity. The annual volume of centralized heating is 73 trillion kilocalories and the annual consumption of standard coal is 11.8 million tons; each million kilocalories consumes 161.4 kilograms of standard coal. The annual averages of coal consumption of the high pressure-high temperature systems and the intermediate pressure-intermediate temperature systems are respectively 310 and 400 gram/kwh and the lowest consumption is 267 gram/kwh. Preliminary data show that 2.2 million tons of standard coal are conserved in thermal power production, 2.8 million tons of standard coal are conserved in centralized heating (power plant boiler) and the total conservation is 5 million tons. On average, 1.13 tons of standard coal are conserved per kilowatt, equivalent to a conservation of 70 kilograms of standard coal per million kilocalorie of heating supply.

According to preliminary statistics, the proposal of building heat and power cogeneration plants calls for an additional 1 billion yuan of investment as compared to the proposal of building vapor condensation power plants and boiler rooms to produce electric power and heat separately. Based on the 5-million-ton level of coal conservation achieved in 1980, the cost for conserving 1 ton of standard coal is 200 yuan; the economic benefit for energy conservation is therefore quite large. However, after the heat and power cogeneration plants are put into operation, it often takes a long while for the utilization of the heat supply capability to build up gradually. The average value over a number of years is therefore lower. Based on a 1962 survey of 15 heat and power cogeneration plants, the average utilization rate of heating ability was 48 percent, out of which approximately 15 percent of the units were fully developed within 2∼3 years after they were put into operation and showed good results in energy conservation,

but most of the cogeneration plants took 5 ~7 years to develop fully and greatly lowered the conservation benefits averaged over the years. Because of a variety of reasons, a few of the cogeneration plants were substantially lower than their designed thermal load and could not fully develop their heating ability after long periods of time. These cogeneration plants not only achieved no coal conservation, they actually consumed more coal.

Actual practice has shown that the key issue in the agreement of actual coal conservation and designed coal conservation is the thermal load.

In the past 20 years, 350,000 kilowatts of condenser power generation units were converted to heating units, roughly half of that was converted to circulating water heating systems. When the small units were converted to circulating water heating units, the power generation output dropped by approximately 25 percent and weakened the original ability for peak adjustment and increased the burden of the grid. In some units, because the thermal load for heating was very low, the electric power output decreased by about 50 percent and the power shortage during the winter season was especially serious. In addition, even though little investment was required in the power plant when small units were converted into heating units using circulating water, the investment costs actually increased because the water temperature was too low and the pipe diameter of the hot water pipe network outside the plant had to be increased. Experience shows that the economic benefits of hot water heating are limited. Economic benefit evaluations consistent with reality must be made for each engineering project.

We now consider the options of tapping the vapor by drilling holes on the condenser or modifying the unit into a vapor back pressure unit. If vapor were tapped for heating purpose by drilling holes on the vapor pipe between the intermediate pressure chamber and low pressure chamber of a 100,000-kilowatt condenser power unit, one would be trading 18,000 kilowatts of power output for a coal conservation of 40,000 tons per heating season. The 100,000 kilowatt condenser power unit at Beijing Heat and Power Cogeneration Plant No 1 has been running for the past 7 years since it was modified and has demonstrated the technical feasibility. The condenser generator unit has been successfully converted to vapor tapping back pressure units for production use. The heat return system of the modified unit is even better than that of an intrinsic back pressure unit but the electric power output is lowered substantially. This shows that the coal conservation effects and the economic benefits of any modification must be evaluated while taking into account the electric power of the whole grid, the peak adjustment ability, the balance of fuel and the profit and the cost. One should not evaluate modifications by considering only a given power plant, otherwise the efficiency will be exaggerated.

II. Problem Analysis for Building Heat and Power Cogeneration Plants

Thirty years of experience has shown that in order to realize the economic benefits of the investments made in building heat and power cogeneration plants, the following major problems must be solved.

1. In China's national economic development plan, the planning of the heating system for industrial and urban areas, the scale of centralized heating by heat and power cogeneration and heating by individual boiler room and the optimum thermal coefficient should all be determined on the basis of overall national interest. But in the past some units and individuals requested the heating facility to provide much more heating than the actual thermal load of the users. Certain design units (especially design units outside power departments), due to their lack of familiarity and experience with computing composite thermal load curve, designed heat and power cogeneration plants merely on the basis of typical thermal load in summer and in winter and the results are increased power generation of vapor flow units under condensation conditions, increased coal consumption, decreased efficiency of the heating network, and the back pressure units based on heat production could never operate at full load and the efficiency was even poorer than vapor pumping units.

In the 1950's and 1960's, there were few power plant industries and enterprises and the ones that did exist were in operation only for short periods of time. Design units lacked experience and had difficulties understanding thermal load and particularly quantitative analysis. We now have more than 20 years of operating experience and accumulated data as the objective basis for thermal load prediction and characterization. For example, the maximum load utilization in the area supplied by Beijing heat and power cogeneration plant No 1 is only about 4,500 hours, but because there are peak adjustment boilers to assume the peak load of the coldest months, the annual utilization of the high investment heat and power cogeneration plant is increased to 5,900 hours.

The job of verifying the heating load lies mainly with the users. We must on the one hand strengthen the quota management and on the other hand develop economic leverage. The system of dual heating rate should be gradually promoted and those units that make no effort to strengthen their management and report arbitrary heat load should be made responsible economically. In some countries the requesting units are charged 50 percent of their heating request whether or not they used any and the other 50 percent is charged according to the actual usage. Two engineering projects in the Ministry for Water Conservancy and Electric Power are following this method on a trial basis and this practice has made some users to withdraw their unrealistic requests and made them more cautious in signing agreements.

In the area of predicting composite heating load curve, some units have begun their work. The task is mainly the simulation of the daily load and the nonuniformity coefficient among the days in a month and the months in a year based on the simultaneity and seasoned variation of heating loads of the existing heat and power cogeneration plants. Analysis based on current data shows that heating load in production has a relatively low simultaneity, generally in the 0.75 0.80 range, daily load is generally above 0.9 and the daily and monthly nonuniformity coefficients are respectively in the 0.9~0.94 and 0.7~0.75 range.

2. Proposal selection and economic evaluation of heat and power cogeneration must be based on overall economic effects and not based on individual enterprise or plant

The coal conservation and economic effects of cogeneration and separate generation are relative and depend on the given situation of heat supply and electric power supply. The model and scale of cogeneration plants are determined mainly by the heating demand and the model and scale of a power plant in a heat and power separation generation scheme is decided by the safe operation of the power system and by economic consideration. Even in the same power grid, the economic and rational single-unit capacity is different for different time periods. Therefore, the substituting vapor condensation units are generally compared to vapor condensation units built at the same time as the heating system. In different time periods the same machine system may gradually change from assuming the primary load to assuming the waist load or peak load and the number of utilization hours will gradually decrease according the economic allocation in the power grid. In a larger grid an uneconomical intermediate pressure vapor pumping heating unit consumes more coal and provides electricity at a higher cost than vapor condensation type power plants already in operation in the grid. Some power plants equipped with back pressure units have a high investment per unit and a higher cost of electricity as compared to power grids but the economic benefit is still quite large according to the rate of electric power. In both cases this is the result of converting the 15 percent sales tax and contract payment to the state into revenue for the enterprise and the local area. Hence a real gain is realized only when the coal consumption and the power generation cost are lower than their counterparts in the power grid.

3. The price of heating is too low and needs urgent adjustment

The current practice of sharing the coal consumption and cost of cogeneration plants is based on the stipulation of the heating law. In this method, on the one hand the decrease in coal consumption for heating is attributed to the increased boiler efficiency in cogeneration plants and the decrease in coal consumption for power generation is attributed to the coal conservation in the thermal power generation, and on the other hand the fuel costs from unloading the coal to feeding into the boiler are distributed according to the percentage of heating fuel and the electric heating bill of the plant is shared by the power generation operation. Experience over the years has shown that in this method of cost sharing the cost of power production of a cogeneration plant is slightly lower than condensation type power plants built in the same period only when the heat capability is fully employed; otherwise the cost of power production is actually somewhat higher. This is therefore a feasible method of subsidizing the heating operation.

The original principle used in setting the heating price was a slight profit beyond cost but the fuel price was subsequently raised several times and the heating price was not adjusted accordingly. As a result the fuel cost accounts for 80 percent of the cost and the heating plants suffered serious

losses. According to statistics, China suffers an annual loss of 90 million yuan on heating and the initiative for providing heating is seriously jeopardized because the more heating the greater the loss.

Heat and power cogeneration is a method of integrated use of the energy resources and neither the coal consumption nor the production cost should exceed those for heat and power separate generation. But some units and individuals in recent years, due to a lack of in-depth understanding of the problem and the situation, stressed the shortcomings of the current heating law and the irrationality of the coal consumption for heating and the cost of providing heating and claimed that the calculation should be based upon an enthalpy decrease method or a kilocalorie/kilogram method. All methods have their merits and shortcomings and whether a method is feasible in practice requires serious study. If computations were made according to the two latter methods, the heating coal consumption will be greatly decreased but the coal consumption for power production will be greatly increased. For example, the coal consumption for power generation by a 50,000-kilowatt high temperature high pressure vapor exhaust heating system is not only higher than a vapor condensation machine of the same capacity but also higher than a medium temperature medium pressure vapor condensation system of equal capacity. The result of this type of calculation is compensating heating costs with the losses in power generation coal consumption and in costs. This contradicts the principle that power generation and heating are both favorable.

The heating price problem involves the financial income of both the central and the local governments and also involves the question of payback ability for new construction of heat and power cogeneration plants. From a long-term point of view, the price should be determined according to capital profit rate. In the short term, a small profit may be maintained on the basis of paying back the loan.

4. Problems of fuel, ash dumps, and pollution

Because of insufficient fuel supply or limited transport capability, independent cogeneration plants often adopt the principle of assuring heating and cutting back on power generation. This invariably increases the burden of the power grid. Since the power grids have their fuel shortages too, the grids will have to cut back on power production or heating supply. This is very uneconomical.

Because cogeneration plants produce great amount of ash and cinder, it is difficult to have dumping ground in cities of large and medium size. Insufficient suitable dump grounds lead to pollution. Due to this reason, cogeneration plants pay large sums in compensation and fines which in turn greatly increase the operating costs of the plant. Some power plants invested great sums of money on the integrated use of coal ash and dust but the results are often unsatisfactory. Therefore the handling of ashes is also an important aspect that affects the benefits of the cogeneration plant.

The big boilers of a heating plant are efficient in ash removal and have high chimneys. As a result, the smoke and gas diffuse far away. The dust and sulphur dioxide concentrations in an urban area adjacent to the power plant is lower than the case of large number of small boilers and small coal furnaces. This is favorable to the improvement of the polluted urban area, but in some places these large boilers are still fined and the cost for heating is increased. This is unfavorable to the development of the heating enterprise. It would also be feasible if such fines are used to clean up environmental pollution.

Judging from the experience of developing heating plants since the revolution, a heat and power cogeneration plant can achieve the goal of energy conservation and better economic effects under certain conditions. Elaborate work will be required to put such conditions on a solid basis. Therefore the policy of cogeneration plant construction should be active and yet prudent. The economic effect and the cogeneration plant have very much to do with the distance of supplying heat and are closely related to the economic targets of the substituting machines in a power grid, especially in power grids with a large percentage of hydraulic power. Cogeneration plants should therefore be built at appropriate locations.

9698
CSO: 4013/150

THERMAL POWER

BRIEFS

SICHUAN POWER PLANT EXPANSION--Chongqing, 19 Nov (XINHUA)--Two new generating units, each with a designed capacity of 200,000 kilowatts, will be installed in the power plant of Chongqing, a major industrial city in Sichuan Province, according to city authorities. Upon completion of the project, the power generating capacity of the Chongqing Plant will be 696,000 kilowatts, making it the largest thermal power plant in southwest China and raising the generating capacity of the Chongqing area by 50 percent. The project includes building a coal dressing plant, dust removing facilities and heightening a chimney to control pollution. [Text] [Beijing XINHUA in English 0804 GMT 19 Nov 82 OW]

HUAIBEI POWER PLANT--Hefei, 27 Nov (XINHUA)--A new 200,000-kilowatt generator went on stream this month, increasing the total generating capacity at the Huaibei Therman Power Plant in Anhui Province to 1.35 million kilowatts, according to provincial officials. The plant uses coal produced locally at Anhui Province's Huaibei and Huainan coal fields. Two more thermal power plants are under construction in the vicinity. The Luohe Thermal Power Plant which will have two generating units, each of 300,000 kilowatts, in its present stage of construction is well along. Preparations are being made for building the Pingxu Therman Power Plant with two 600,000-kilowatt generating units in its first stage of construction. [Text] [Beijing XINHUA in English 0708 GMT 27 Nov 82 OW]

LUOHE POWER PLANT--Hefei, 13 Dec (XINHUA)--Construction has started at the Anhui Coal Center, one of China's biggest, on a powerplant which will eventually be fitted with generating units with a combined capacity of 1.2 million kilowatts, provincial authorities of Anhui announced today. The current stage of the construction for the Luohe Power Plant calls for installing two generating units, each with a generating capacity of 300,000 kilowatts. The Luohe Power Plant is a key construction project during China's Sixth 5-Year Plan period (1981-85), provincial authorities said. China's current policy encourages building of power plants in mining areas. Four electricity generating units with a combined capacity of 550,000 kilowatts were put into operation earlier this year at the Shentou Power Plant in Northern Shanxi Province, China's leading coal producing area. [Text] [OW161417 Beijing XINHUA in English 1509 GMT 13 Dec 82]

SHENTOU POWER PLANT--Taiyuan, 27 Aug (XINHUA)--Four generators with a combined capacity of 550,000 kilowatts have been put into operation at the Shentou Power Plant now under construction in northern Shanxi Province, China's biggest coal-producing center. The plant uses locally-produced coal to generate electricity, according to provincial authorities, in an effort to ease the pressure on railway transport of coal out of the province. Its third stage of construction is now in full swing. Shanxi Province produced 130 million tons of coal in 1981, accounting for 1/5 of the national output. Electrification projects are under way on some railways to get more coal out of it. Under China's current energy policy, construction of thermal power plants in mining areas is being encouraged. [Text] [OW101357 Beijing XINHUA in English 1605 GMT 27 Aug 82]

NEI MONGGOL POWER PLANT--Hohhot, 23 Nov (XINHUA)--A 600,000-kilowatt generator will be installed in a thermal power plant in eastern Nei Monggol to increase power supplies to northeast China, according to plant officials. The equipment, imported from France, is part of the Yuanbaoshan Power Plant's second stage of construction scheduled to be completed in 1985. The boiler and water treatment facilities will come from West Germany. The plant in Chifeng City now operates a 300,000-kilowatt generating unit also imported from France, officials said. A nearby brown coal mine provides the plant with its total annual production of 1.2 million tons. A large open-pit coal mine is being built to supply coal for the new generators. [Text] [Beijing XINHUA in English 0706 GMT 23 Nov 82 OW]

JIANGSU POWER PLANT EXPANSION--Nanjing, 6 Nov (XINHUA)--The Xuzhon Power Plant in Jiangsu Province, one of the six largest power plants in east China, is expanding its power generating capacity in order to meet the growing need in the country, according to Wu Zhongshun, director of the plant. Upon completion of the new project in 1987, he said, the plant will increase its power generating capacity from the present 500,000 kilowatts to 1.3 million kilowatts and will be able to provide electricity to China's largest industrial city of Shanghai. The plant, with a designed generating capacity of 500,000 kilowatts, went on stream in 1979. The verified coal reserves in Xuzhou, one of the major coal mining centers in east China, is estimated at more than 2,000 million tons. Annual coal output in the area exceeds 11 million tons. Using locally produced coal, Xuzhou also has 3 more thermal power plants each with a generating capacity of 100,000 kilowatts, the director said. [Text] [Tokyo KYODO in English 0727 GMT 6 Nov 82 OW]

CSO: 4010/26

XUANWEI POWER PLANT--With an installed capacity of 200,000 kilowatts, Yunnan's Xuanwei thermal power plant is the largest to date in the province. This year, because of the serious dry spell in Yunnan, there is little water in the reservoirs and hydropower supply cannot keep up with demand, requiring more electricity from thermal power plants. Galvanized by the spirit of the 12th party congress, personnel of the Xuanwei Thermal Power Plant, vying with each other for the most difficult tasks, have produced more power. As of the end of October, they had produced 300,000,000 kwh more than in the same period of 1981, setting a new record for the plant and contributing to the socialist modernization of the province. [Text] [Kunming YUNNAN RIBAO in Chinese 16 Nov 82 p 4]

YONGAN POWER PLANT--Recently, the 180-meter-high smokestack of the Yongan thermal power plant, one of the major construction projects in Fujian Province, was completed without a hitch. The 180-meter-high stack is the first in the province. When the third phase of construction is finished, the plant will have six units with a total installed capacity of 350,000 kilowatts, the largest thermal power plant in the province. [Excerpts] [Fuzhou FUJIAN RIBAO in Chinese 19 Oct 82 p 1]

DATONG NO 2 POWER PLANT--The Provincial First Electric Power Construction Company, the unit responsible for building the Datong No 2 Power Plant, has accelerated the pace of construction to complete the whole year's 24 million yuan work plan in 10 months, 4 million yuan more than 1981. Basic work on the No 2 210-meter-high stack, the 85-meter-high cooling tower, the six generating units, and the six boilers has been completed. The No 1 generator stator and the steam turbine low pressure vessel are now in place; the No 1 boiler main assembly has been finished and the main coal crushing machinery and the three starter boilers have been installed. The staff and workers are confident that they will have the first Chinese-made 200,000 kilowatt generator operational by 1984. [Taiyuan SHANXI RIBAO in Chinese 11 Nov 82 p 1]

LIANCHENG THERMAL POWER PLANT--On 27 September 1982, the No 2 generator of the Liancheng Power Plant officially joined the grid. Bearing an 80,000-kilowatt load, it is operating normally. The Liancheng Power Plant is one of Gansu Province's large-scale pit-mouth thermal power plants, designed for four generators of 100,000 kilowatts each for a total installed capacity of 400,000 kilowatts. The project is divided into two stages. The first stage of the project entails the installation of two generators. The No 1 generator joined the grid at the end of December of last year [1981], and the No 2 generator was successfully tested in the evening of 24 September [1982]. After a 72-hour test run, it officially joined the grid. The first stage is now 2 months ahead of schedule and will enhance the reliability of the power supply during the dry season. [Excerpts] [Lanzhou LANZHOU BAO in Chinese 28 Sep 82 p 1]

CSO: 4013/85

SHANXI POWER TRANSMISSION LINE--Beijing, 17 Nov (XINHUA)--Construction is well underway on north China's first 500,000-volt power transmission line across the Taihang Mountains, from Shanxi Province's Datong to Beijing's suburbs, according to the BEIJING DAILY. The 300-kilometer line originates at a thermal power plant in Datong, a major coal producing center, to Fangshan, a suburban county of Beijing. Completion of the line will increase power supplies to China's capital and relieve pressure on various power sources in the Beijing-Tianjin-Tangshan area as a whole, the paper said. Most of the equipment and materials on the Chinese-designed line are domestically produced. To date, 90 percent of the line's transmission tower foundations have been completed and 30 kilometers of line erected, the paper reported. Construction of the Datong No 2 Power Plant is underway and equipment is being installed in Beijing's substations. [Text] [Beijing XINHUA in English 1120 GMT 17 Nov 82 OW]

LIAONING HEAVY INSULATOR PRODUCTION--Shenyang, 11 Oct (XINHUA)--China's first production line making procelain insulators for 500,000-volt power transmission lines has begun trial operation in Fushun in Liaoning Province, northeast China. The line, installed at the Fushun Electric Porcelain Insulator Plant, will produce more than 500 tons of porcelain insulators each year. Previous to this, China had to import the product. The line was built in 2 and one-half years, 6 months ahead of schedule. [Text] [OW262349 Beijing XINHUA in English 0758 GMT 11 Oct 82]

CSO: 4010/27

COAL

ADOPTING NEW APPROACHES TO CREATE NEW PROSPECTS FOR COAL INDUSTRY

Beujing SHIJIE MEITAN JISHU [WORLD COAL TECHNOLOGY] in Chinese, No 9, 12 Sep 82, pp 2-3

[Article by Gao Yangwen [7559 2254 2429], Minister of Coal Industry]

[Text] For the past 32 years, China's coal industry has realized great achievements and has established a good foundation for future development. But we must clearly see that over the past 30 years and more, the world's major coal producing nations have completed several major changes in the history of development of the coal industry: They have changed from manual labor to mechanization, and production efficiency has been greatly improved. They have changed from the inability to control major disasters to basically being able to control them, and safety has fundamentally improved. They have changed from the production of raw coal towards processing and in-depth processing, from the production of a single product to many products and to the development of gasification and liquefaction. They have changed from singular operation to the development of comprehensive operation. As the output of coal increases, the transportation of coal has changed from small tonnage trucks to large tonnage coal freight trains, coal barges, automated loading and unloading, and pipeline transport. These changes are the very weaknesses of our nation's coal industry, and constitute the difference between us and foreign nations. To enable coal production to have a steady, stable, and healthy development, we have decided to realize these changes as quickly as possible.

The coal industry occupies an especially important position in our nation's socialist construction. At present, in China's energy structure, coal constitutes 70 percent. This will not change greatly within a relatively long period in the future. Our coal resources are very rich. The known reserves are over 600 billion tons, and future reserves are even larger. Comrades of the central leadership have often stated that China's coal is a very large advantage. They require us to develop the coal industry in the next 10 years. Therefore, the coal industry is faced with a very difficult task. The next 10 years can be regarded as 10 critical years.

How can we accelerate the development of the coal industry? According to the ten principles for future economic buildup of our nation, we have widely listened to the opinions of experts of all sectors and we have established an

outline for a plan. In guiding ideology, we must further mobilize the several million workers on the coal front, lift up our spirit, open up new roads to develop the coal industry, think of ways to push coal industry forward, and adapt to the needs of national economic development. The important point of this new road is that the rate of progress is more stable (not rising and falling dramatically), the development is healthier (the arrangement must be rational, the foundation must be strengthened, the quality must be improved, the proportions must be coordinated), the economic benefits are better (the internal cost of coal must be low, losses must be reduced and profits must be increased, the important thing is that the comprehensive benefits and the benefits of energy conservation in society are good), production must be safe, we must control major accidents and the occurrence of vocational diseases.

To open up a new road and realize our goals, we are implementing and preparing to implement a series of concrete principles and economic policies to further mobilize the enthusiasm of the broad number of workers, the coal enterprises, the localities and the various professions to engage in coal mining. At the same time, we are implementing many practical steps: We are carrying out overall technical improvements of old mine shafts that have suitable conditions; we are further implementing the principles of safe production, we are expanding the scale of construction of new shafts and shortening the construction period; we are hastening the development of education and scientific research; we are improving the cultural, technical and managerial standards of workers and correspondingly improving the material, cultural and living standards of workers; we are greatly improving and elevating the quality of the coal industry in various aspects so that we can complete the glorious task of providing a major source of energy for the motherland's four modernizations.

To realize the strategic goals in developing our nation's coal industry, we must widely use advanced technological processes, technologies and equipment for geology, construction, mining, coal washing, processing and utilization, and develop coal science, including research in technical science and economics. We must develop academic exchange with the same professions of the coal industry of the world's nations, scientific research units, and universities (academies) to learn from each other and to use the advantages to make up for shortcomings. We must also learn advanced foreign technology and scientific management experience via cooperative development and cooperative manufacturing. The future of China's coal industry is bright. In the not-too-distant future, it will emerge on the stage of the world's coal industry in a brand new appearance.

Our nation has many favorable conditions to develop the coal industry: Coal resources are rich. We already have a foundation of producing 600 million tons a year. We have grasped a definite advanced technology and a definite capability to manufacture equipment. In particular, we have a team of hard working, intelligent and courageous workers, technical personnel and cadres. Of course, we will encounter difficulties in the road ahead. But, we believe, with the correct leadership of the Central Committee of the Party, with the hard struggle of several million coal workers, we will surely open up a new road and create a new situation for the coal industry.

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CSO: 4013/18

SYMPOSIUM ON RATIONAL CONCENTRATION OF MINE PRODUCTION HELD

Beijing MEITAN XUEBAO [JOURNAL OF CHINA COAL SOCIETY] in Chinese No 3, Sep 82 p 95

[Article by Mei Bian [2734 6708]]

[Text] Entrusted by the China Coal Society, the JOURNAL OF CHINA COAL SOCIETY and the editorial department of COAL SCIENCE AND TECHNOLOGY [MEITAN KEXUE JISHU] called a "Symposium on Rational Concentration of Mine Production" at the Mojiang Coal Mine from 6-11 May 1982. A total 120 representatives from related coal mines, design institutes, and institutes of higher learning participated in the symposium, where altogether 57 reports and papers were received.

Since the editorial department of COAL SCIENCE AND TECHNOLOGY started its special discussion on "Rational Concentration of Mine Production" in its No 4, 1981 issue, it has received a total of 85 manuscripts (20 have been published). The representatives who participated in the symposium were mainly authors of papers selected for discussion. The symposium adopted the format that a report on a special topic was first presented, which was then followed by concentrated academic discussion by the representatives. This format was advantageous in allowing the representatives to start an academic discussion. As a result, the symposium was lively and the discussions had more depth.

First, the representatives explored the goals and meaning of rational concentration of production. Lecturer Wang Yujun [3769 3768 3182] from the China Mining Institute gave a report on the "Indicators and Methods of Rational Concentration of Mine Production." He believes that from the angle of industrial economic management the special characteristics of the coal industry are its unitary product and its large demand. Thus, mine production is suitable to concentration or it is an enterprise suitable to large scale development. The rational concentration of production of coal mine enterprises may be broadly defined as follows: "The rational concentration of production is a concentration of production means and labor in both time and space. It is also to achieve the largest production and best economic results within a relatively short time, in a relatively small space, and with a relatively small labor consumption." At the same time, Comrade Wang Yujun also introduced the production concentration experiences of Great Britain, West Germany, Poland, and Japan. Tong Enrui [0157 1869 3843], an engineer from the Ministry of Coal, also introduced the experience of the Soviet Union in concentration

of coal mine production. The representatives believe that because of the many differences in coal mine production conditions, different requirements for concentrated production should be advanced according to these conditions. The primary goal is for the mine to be able to achieve better economic benefits.

The symposium paid a great deal of attention to the exchange of new experiences and new developments from the "four concentrations." These included the concentration reconstruction of the Pianpan inclines of the Jixi Mine; the implementation of horizontal concentration in the sectionalized continuous mining of the Wangshiyao Mine of Tongchuan; the experience of rational concentration of production in the mining areas of the Kailuan Coal Mine; the methods of concentrated production at the working faces of the Datong and Zaozhuang mines; and the several methods of rational concentration of production used for the production shafts by the Huibei Mining Bureau.

The important points on how to reflect the rational concentration of production in mine design were presented by Xu Dezuo [6079 1795 0146], an engineer from the General Institute of Planning and Design of the Ministry of Coal. This question was discussed by [representatives from] design and production departments. They believe on a unanimous basis that the design of a new mine not only should meet advanced technical requirements but also should pay attention to the conditions of our country and to production realities.

Discussions were also carried out at the symposium on the relationship between concentration of production and technical reconstruction and between concentration and mechanization. The representatives discussed a report on "The Technical Reconstruction of Mines" by Comrade Yang Yougen [2799 2589 2704], chief of the Office of Development, Department of Production, Ministry of Coal. They unanimously believe that coal mine production is one of multi-systems and, moreover, the working locations continuously change with time. Thus, from the standpoint of objective rules of mine production, even if we do not expand production capacity, we should nevertheless carry out technical reconstruction of a mine in order to achieve stable production, improve the business results of the mine, or prevent large scale decrease of production. And the basic way for reconstruction is to practice concentration of production. The production experiences of many large mines in our country, such as Pingdingshan, Kailuan, Jixi, and Datong, show that mine technical reconstruction and concentration of production are mutually supplementary and mutually formative. Zhu Peihua [2612 1014 5478], senior engineer from the headquarters office of the Datun Coal Mine, also gave a talk on the relationship between mechanization and concentration.

Assistant Professor Wu Shaoqian [0702 4801 0241] of the Xi'an Mining Institute presented the important points on the questions of the necessity of research on the index of concentration of mine production, the analysis of these indices used both domestically and abroad, and the relationship between concentration of mine production and economic results. Heated discussions on these questions were developed among the representatives. Some representatives believe that a group of indices should be established to measure the degree of mine concentration. Other representatives believe that only one

index is needed for the measurement. Still others believe that the existing index in the report of the Ministry of Coal should be used for evaluation and that it is not necessary to establish new indices.

The final summarization of the symposium was made by Comrade He Zhenying [0149 2182 5391], Chief of the Office of Scientific and Technical Information, Coal Research Institute.

The summarization of the symposium on the special subject of "rational concentration of mine production" will be carried in the No 12, 1982 issue of "Coal Science and Technology." The editorial department of "Scientific Coal Research References" will publish a special issue entitled "Rational Concentration of Mine Production" in 1983.

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CSO: 4013/38

COAL

OPENING A NEW PATH TO DEVELOP THE COAL INDUSTRY

Beijing MEIKUANG GONGREN [COAL MINER] in Chinese No 10, 1982 pp 2-3

[Article: "Thoroughly Carry Out the Spirit of the CPC 12th Party Congress; Opening a New Path To Develop the Coal Industry"]

[Text] The CPC 12th Party Congress was a meeting of important historical significance. The political report made by Comrade Hu Yaobang during the 12th Party Congress is the new guiding principle for the construction of a strong and modernized, highly civilized, and highly democratic socialist nation. In economic construction, it defines the strategic targets for 20 years of development. Politically, it presents an important guarantee to firmly maintain the socialist system and to achieve modernization. The new party constitution passed by the congress presents stricter demands on all the party members and establishes clear requirements to raise the party's fighting strength and further strengthen the construction of the party. All the party members and the large staff and workers of the coal front must treat the opening remarks of Comrade Deng Xiaoping as the leading ideology, conscientiously study the documents of 12th Party Congress, deeply understand the spirit of the 12th Party Congress, firmly transform it into their individual practical activities and struggle to create a new prospect of socialist modernization construction.

The report of the 12th Party Congress establishes that in the 20 years between 1981 and the end of the century the country's annual gross industrial and agricultural production value is to be quadrupled. In order to achieve this gigantic target, the acceleration of coal construction is the strategic task to push forward the economic construction for socialist modernization. According to estimates, annual coal production will rach 1.2 billion tons by the end of the century. This is to say that production within the next 18 years is to be increased by another 600 million tons, equivalent to the output achieved in the more than 30 years since the founding of the People's Republic.

In order to achieve this difficult and glorious task, we must establish this leading ideology: rouse our spirit, change our working style, vigorously open a new path for the development of the coal industry, and move the coal industry forward in every way possible to meet the needs of the national economy. Our initial thinking is that the basic requirements for this new path are: relatively steady rate of increase (not large ups and downs but long-term steady

increases), relatively healthy development (distribution must be rational, proportion must be regulated, methods must be advanced, and the quality of the ranks must be improved), relatively safe production construction (cannot pay the price of the many fatalities and injuries of the past), and relatively good economic benefits (rate of construction must be high, results of investment must be good, quality and types of coal must be changed, processing and comprehensive utilization must be developed, and economic benefits of the enterprises, energy conservation benefits for the society, and comprehensive benefits for the state must be greatly improved).

To realize the basic requirements described above, changes in six areas will be needed. First, key coal mines must be changed from primarily manual operations to primarily mechanized production. Second, we must change from our inability to control the occurrence of major vicious accidents and occupational diseases to being able to fundamentally control and basically change unsafe conditions. Third, we must change from unitary production of raw coal to multiple production and develop toward gasification and liquefaction. Fourth, we must change from single operations to comprehensive operations and develop joint operations of coal and electric power and coal and chemicals. Fifth, we must change from transportation with small tonnage cars and small horsepower locomotives to transportation with large tonnage trains and ships, mechanized loading and unloading, and supplementary slurry pipelines. Sixth, we must change from simply relying on administrative measures to relying on combined administrative and economic measures and we must develop the production positiveness of the regions, enterprises, and staff and workers through the establishment of rational economic policies, systems reform, and the promotion of the economic responsibility system.

To open a new path for the development of the coal industry, we need to thoroughly carry out the following 12 concrete policies:

(1) Carry out technical reconstruction of mines with planning and priorities and fully develop the influence of existing coal enterprises. The first is to vigorously develop the mechanization of mining, development and haulage, actively develop high standard general mechanized mining, steadily develop totally mechanized mining, and vigorously develop the mechanization of low coal. The mechanization of local small and medium mines must also be gradually improved. The second is to reform mining techniques and change outdated, old and nonuniform equipment. The third is to improve production safety measures. The fourth is take hold of the overall technical reconstruction of mine shafts.

(2) Accelerate coal development, shorten construction period, and fully develop the results of investment. The scale of construction must be increased and rate of construction accelerated. The distribution must be rational with priority given to the development of areas in Shanxi, eastern China, the Northeast, Hebei and Henan, western Guizhou, and north of the Wei River to establish 10 coal bases.

(3) Vigorously develop local coal mines. The four policies relative to local coal mines adopted by the State Council must be firmly carried out--subsidy of

mines with losses, appropriate reduction or exemption of taxes, increase of capital investment and technical reform funds, and increase of expenses.

(4) Vigorously develop coal washing, processing and comprehensive utilization and change the structure of coal products. The proportion of washed coal must be increased. Comprehensive utilization must be developed, along with the promotion of the processing molded coal, development of gasification, and liquefaction experimentation and research.

(5) Promote and perfect various economic responsibility systems. The double contracting for production and profits (losses) should be practiced. The contract should be for 3 to 5 years without change. The contract target for production should be based on appraised comprehensive production capabilities. Consideration should be given to the state, the local area and the enterprise.

(6) Actively utilize foreign capital and develop domestic funds without restriction. In the next 10 years, foreign capital should be utilized to develop a group of new mines and at the same time a definite quantity of coal should be exported. Domestic funds should be developed to reconstruct existing producing mines and construct a group of new mines with good conditions. The use of coal by the units which raise the funds should be guaranteed.

(7) Properly develop joint operations between region, department and enterprise.

(8) Implement the policy of "safety first" with determination. From now on, at the same time that management is strengthened, a firm hold should be placed on safety technology and equipment (including importation) and the safety training of the staff and workers on a priority basis, so that major disasters are basically controlled and injury and fatality rates greatly reduced.

(9) Adopt concrete measures and strengthen underground staff and workers. The ideological and political work must be strengthened to educate the staff and workers to establish the ideology of dedicating one's life to the coal cause. Such effective policies as the working longevity allowance for underground workers and the labor system of using both permanent workers and contract workers must also be practiced to strengthen the forces.

(10) Strengthen intellectual development and raise the scientific and cultural levels and technical quality of the staff and workers. Higher and specialized institutes and technical secondary schools for the coal system should be properly developed. At the same time, social forces should be utilized to train technical personnel. The training of the staff and workers should be vigorously strengthened and technical schools properly developed so that all technical workers will be rotated through training once before 1985.

(11) Vigorously develop scientific research on coal. This should be aimed selectively at key technical problems in current production development and

long-range development, especially in organizing to overcome technical problems in technical reconstruction, safety techniques and equipment and mechanization of coal mines.

(12) Unify planning and arrangement, coordinated construction, and solve the coal haulage problem in coordination with the railway and other communications departments.

This new path outlined is only an initial framework to be followed. It must be improved and perfected in actual practice to make it more concrete. In actual practice, there must be the ideology of pushing it forward on a total basis. Its development on a piecemeal basis must be avoided. Creativity must be fully demonstrated and it must move forward firmly, paying attention to and seeking actual results and producing results each step of the way. Only in this way can we fulfill the spirit of the 12th Party Congress more thoroughly and open a new path for the development of the coal industry.

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CSO: 4013/42

COAL

NEW TASKS FOR CHINA'S EASTERN COAL MINES DISCUSSED

Beijing MEIKUANG GONGREN [COAL MINER] in Chinese No 11, 1982 pp 2-3

[Article: "New Tasks for China's Eastern Coal Mines"]

[Text] The CPC 12th Party Congress listed energy resources as one of the strategic priorities for economic construction. In the future process of great developments and great changes for the coal industry, the acceleration of development and increase of production on a large scale of the eastern coal mines is a major event for us to carry out the spirit of the 12th Party Congress. It is a difficult and glorious new task facing the staff and workers of coal industry front.

New Changes in Economic Situation

Very large changes have taken place in the economic situation of the eastern regions in recent years. Their economy has grown continuously and their need for energy resources has also increased without interruption. However, the coal production in these regions has not increased very much. In some cases, output has actually decreased. Shipments of coal from the west to the east and to the Northeast from other parts of China have increased drastically. However, rail transport capacity is now basically saturated and a very large contradiction has occurred in supply and demand. This is particularly serious as the eastern regions are an economically developed area of our country. The country depends primarily on these regions for its materials, finance, grain and foreign trade. The development of the national economy depends primarily on these regions and coal shortage has become one of the major problems.

New Policy

How do we solve this problem? The simplest way is to ship more western coal to the east. However, this cannot be done within 3 to 5 years. Even if the problem of rail transport is solved, the capacity still has certain limitations. Consequently, this problem depends mainly on the eastern regions to solve internally. The total region has the necessary resources requirements. The solution lies in two ways (this is talking from the standpoint of production). One is to increase the scale of construction and accelerate the rate of construction. The second one is to produce more coal from existing

coal mines. The first way is now being done and we still must take a good hold of it from now on. However, water in the future cannot quench the thirst now. We cannot depend on this at all for at least another 5 to 10 years. Thus, for the near term, the medium term, or at least 5 or even 10 years from next year, we have to depend primarily on existing producing mines. Is there a possibility for the existing producing mines to increase production? The existing mines, especially those in the east, are the ones which made a great effort to produce more coal in the past. Not only have they greatly exceeded their original designed capacities but they have also exceeded their appraised comprehensive production capacities. Some are on the road of aging and some must also be abandoned. There are certain difficulties for increased production. However, the requirements for increased production and the possibilities for increased production similarly exist. Exactly what policies and what measures we should adopt to change possibilities to reality and to greatly increase the scale of production? The policy is to increase the mining intensity of existing mines.

Increasing mining intensity will mean reducing the service life of the mines. Some of the mines in the eastern regions have a very long service life of 50 or 60 years. Even with a few years of reduction, they would still be within their original norms and there would not be any effect. Some of the mines have already been in operation for several tens of years. A suitable reduction of a few years would also be rational and should not present any problems. There are some mines which have only limited reserves and their service life will not be very long if we increase their mining intensity. How do we view this problem? The problem must be analyzed from the overall situation. Since the state has an urgent need, we have no choice but to cut them off. Everything is done to guarantee that the national economy will move forward in the next 10 years. It is a question of paying the price of reducing the service life of some mines for the rate of development of the national economy. We cannot hold on to the service life and let the coal lie in the ground and not mine it, while we watch the plants shut down.

After 10 years, the financial resources and material resources of the state will have been strengthened, the size of mines constructed will have been increased, the production capacity of new mines will have been increased, and transportation will also have moved forward. By that time, large quantities of western coal can be shipped out. Thus, reduced production from mines with reduced service life will not be much of a handicap to the overall situation.

Will increasing mining intensive create any new imbalance? As long as we keep a cool head, do things with planning and coordination, and use scientific measures, an imbalance will not occur. This is different from mining blindly and developing blindly. If we mine and develop in a chaotic manner, an imbalance will occur even if mining intensity is reduced.

New Tasks and Measures

It is possible for the eastern regions to have a net increase of coal production of 7 to 10 million tons next year. The key lies in the measures to be taken.

First, achieve increased production through reorganization.

Develop potentials through reorganization and develop potentials through management. This point has been proven by the experiences of many units. Judging by some of the units which understand this, "five lows" commonly exist in the coal mines: one is the low rate of coal miner attendance. For many coal mining teams, this rate is less than 70 percent. The second is the low rate of work time utilization. In many units, this rate is only 60 percent. The third is the low rate of equipment utilization. For the entire country, the utilization rate of the total mechanization equipment is only a little over 50 percent and the utilization rate for general mining machines is less than 30 percent. The fourth is the low rate of normal operation cycle which in many mines is less than 50 percent. The fifth is the low unit production of working faces. Among the 44 bureaus in the eastern regions, 30 of them did not reach their highest historical level of production during the January to June period, of which 13 fell below their highest historical level by more than 1,500 tons. These five lows are the potentials for increased production. Based on the estimates of some bureaus, if the work time utilization is increased by 10 minutes over the original 300 minutes, they could produce an additional 200,000 tons of coal a year. If during the mining process, no roof and floor coal is lost and surface coal is swept clean, over 100,000 tons of additional coal could be produced. If all the 46 bureaus in the eastern regions make the same computation, we could see the magnitude of the potential.

Another example, the eastern regions have more than 70 totally mechanized mining teams. Among them, there are over 10 low production teams. If these teams can acehive the level of the ranking teams, several hundred thousand tons more coal can be produced each year. The transport of the mechanized mining equipment from one face to another takes a long time, averaging 40 days. On the other hand, the ones which move rapidly take only about 20 days. If the average is reduced to 30 days, the more than 70 teams in the eastern regions can increase their total production by more than 1 million tons a year. These are problems under the work management area. If reorganization is properly carried out and management in various areas is strengthened, it is possible to produce several million more tons of coal a year.

Second, achieve increased production through strengthening technical reconstruction.

In order to increase mining intensity, it is necessary to carry out a series of technical reconstruction work. A complete set of technical measures should be adopted according to the objective requirements of mine production, measures involving the working face, haulage, hoisting, ventilation, pumping, and safety. In adopting technical measures, we cannot hold on to old rules. We must liberate our ideology and think of some new ways based on the realities.

For instance, in mining equipment, whenever totally mechanized equipment can be used in a working face, conditions should be created for its use. Where conditions exist for the use of high standard general mining equipment, its

use should not be delayed. Among the 40 planned high standard working faces in the country for this year, 24 are in the eastern regions and we must make sure that they are all put into production. Based on the annual output of the existing high standard working faces, a high standard working face can produce 100,000 more tons of coal a year than a general mining working face. Thus, if the 24 high standard working faces can be put into production this year and they reach the production level that they should have next year, we can produce over 2 million more tons of coal next year.

When the production of a working face increases, various links must follow closely so that they can be mutually supportive. This is particularly true with problems in development, haulage, hoisting, storage and loading. These problems must be solved simultaneously. They must not be permitted to be a bottleneck, prevent the shipment of available coal, or create a new imbalance.

The mines already identified for priority technical reconstruction must carry out the design and construction work as quickly as possible and become forces rapidly. During the "five five" period, mines which can be placed in production easily must take a firm hold on fully equipping themselves and start production as quickly as possible. The new mines which have started production since last year must complete what still needs to be done or start their second stage construction in order to achieve their comprehensive production capacities at an early date. These are important factors for increased production within the near terms and must be taken hold of and properly carried out.

In addition, we must also properly take care of the production of small centrally coordinated mines with undefined capacities. Last year, these mines in the eastern regions produced 9.32 million tons of coal. This is an impressive quantity and should not be overlooked. Also, the outcrop coal and edge and corner coal must also be mined as much as possible, so that overall output from small mines will increase continuously.

Third, achieve increased production through improving economic policy.

In order to arouse the positiveness of the coal mines and their large staff and workers to produce more coal and to produce good coal, the state has decided to adopt appropriate economic policies for the coal mines. Within the coal mine enterprises, it is necessary to learn the experience of the Shoudu Iron and Steel and uniting with the characteristics of coal mines, promote and perfect the economic responsibility system to achieve the unification of responsibility, authority and benefit and arouse the positiveness of the large staff and workers for increased production.

In summary, the measures to achieve increased production from existing mines are to rely on reorganization, management, technology and policy. When the several measures are taken together, there is great hope for increased production.

5974
CSO: 4013/65

'RENMIN RIBAO' ON CONSTRUCTION OF DATONG COAL MINE

HK120820 Beijing RENMIN RIBAO in Chinese 6 Nov 82 p 3

[Article by Liu Shugui [0491 2579 6311], director of Datong Mining Bureau, Shangxi: "Expeditiously Build the Datong Coal Mine Into a New-Type Energy Base"]

[Text] The 12th Party Congress has listed the solution of the energy problem as a strategic priority in economic growth. Filled with confidence, all workers and staff members of the Datong Mining Bureau will certainly live up to the expectations of the people of the whole country by speeding up the development of coal production and building the Datong Coal Mine into a new-type energy base.

As a large bureau, the Datong Mining Bureau plays an important role in the development of the national economy. In our efforts to realize the grand objective of developing the national economy, our bureau has decided, in light of the actual conditions in our unit and through repeated studies and discussions, to increase, by relying on the existing mines, the net coal output by 1.5 million tons annually in the 4 years between 1982 and 1985 and to increase the net coal output by 2 million tons annually in the 5 years between 1985 and 1-90. The profit supplied to the state will also increase in coordination with the output growth.

Viewed from historical experience, in order to steadily increase output, it is necessary to adopt a new approach.

1. We should improve efficiency and increase output by means of mechanization. In our efforts to attain the strategic objective, we should not rely on the enormous increase of people but should adopt new technology and equipment, raise the level of mechanization and change our technological outlook. At present, the level of coal-mining mechanization in our bureau is 63 percent, with the level of comprehensive mechanization at 41 percent and that of ordinary mechanization at 22 percent. Mechanized coal extraction accounts for a very big proportion in our bureau. In the future, in addition to relying on state support, we should put in a lot of effort in providing workers and staff members with technical training and in overhauling the equipment regularly in order to prolong the service life of our equipment. At the same time, we should devote a lot of time and energy to the production and

application of home-made comprehensive equipment. Our tentative idea is to build, by 1985, a demonstration mine in comprehensive mechanized production which should have great output, employ few personnel and have high labor efficiency and low costs. While doing a good job of running and applying the comprehensive equipment, we should adhere to the simultaneous development of a comprehensive mechanized coal-mining method and a common projectile coal-mining method in order to bring into full play the role of the existing machinery and equipment.

2. We should tap potential by means of technological transformation. By 1985 the annual output of our bureau is scheduled to reach 30 million tons and we should chiefly rely on technological transformation to realize this objective. While guiding current production, we should pay close attention to the transformation and extention of three mines and the transformation of some big links. The Jinhuagong Mine now under construction has an estimated capacity of 2.6 million tons. After being transformed and extended, it will have a net increased capacity of 1.2 million tons. It is scheduled to go into production in about 5 years. The Wangcun and Yungang Mines, which will go into production either next year or the year after, will have a net increased capacity of 600,000 and 900,000 tons, respectively, after being extended. At the same time, it is necessary, on the basis of making full use of existing facilities, to carry out technological transformation of the principal links of production, such as ventilation, transportation, bolting, elevation, storing and loading, on the seven mines such as Meiyukou, Yongdingzhuang and Tongjialiang. It is also necessary to transform and build public facilities, living quarters and service facilities for the workers and staff members in the mining areas. After transformation, the comprehensive capacity of various links in the whole bureau will reach 28.37 million tons by the end of this year and 32 million tons by the end of 1985, thus laying a reliable foundation for realizing the tentative plan of producing 30 million tons of coal in 1985.

3. We should step up opening and excavation. A basic law in developing coal production is to develop mining and excavation simultaneously with excavation starting before the mining. At present, relatively sufficient work has been done in our bureau with regard to opening, preparation and stopping. However, there is uneven development in various mines. At present, the output growth is greater than excavation speed. In addition, the cross tunnel coal face needed for comprehensive mechanized coal mining has increased. This makes it necessary for us to step up opening and excavation and the excavation of the cross tunnel. It is necessary to make a specific analysis of individual mines and emphasize helping these mines in order to ensure that, in future development, all mines will attain a balance between mining and excavating, sustain maining with excavation and promote excavation with mining, thus preventing the disproportion between mining and excavation and ensuring the steady development of production.

4. We should speed up the construction of new mines. We are scheduled to finish building three mines by 1990. The Qanzishan Mine now under construction has a design capacity of 4 million tons. Preparation has started for the construction of the Sitaigou and Gaoshan Mines which have a design

capacity of 4 million and 450,000 tons, respectively. Construction of the two mines will start very soon.

In order to exploit the underground coal resources, it is first of all necessary to arm the people mining the coal. As far as the technical and management levels of the entire ranks of workers and staff members are concerned, we are still unable to adapt ourselves to the requirement of the four modernizations. Judging from the requirement of making the ranks of the cadres more revolutionary, younger in age, better educated and more professionally competent, the gap is very big. Since the 12th Party Congress, we have reorganized the leading bodies at the bureau and mine levels. The number of cadres at the bureau level has been reduced from 13 to 9. Their average age has been reduced from 55.2 to 49.3 and the proportion of cadres with university or college degrees has been increased from 31 to 56 percent. The number of cadres at the mine level has been reduced from 128 to 98, their average age has been reduced from 49.1 to 45.5 and the proportion of cadres with university or college degrees has been increased from 21.6 to 40 percent. We should continue to do a good job in this respect. We have trained in rotation more than 20,5-0 workers and staff members this year. Preparation is now under way for the establishment of a training center. We shall improve the political and technical quality of the ranks of workers and staff members by doing a solid job in order to adapt ourselves to the requirement of creating a new situation.

CSO: 4013/88

COAL

SHANXI COAL PRODUCTION, TRANSPORTATION INCREASE YEARLY

Taiyuan SHANXI RIBAO in Chinese 27 Aug 82 p 1

[Article: "Our Province's Coal Production and Transport Increase Yearly"]

[Text] Since the 3d Plenary Session of the 11th Party Central Committee, the production and construction in coal in Shanxi Province has thrived as they had not been before. For 3 consecutive years, the coal output throughout the province increased progressively by 11 million tons, and some 8 million more tons of coal were transported to other provinces every year. On the average, every 6 minutes, there is a train carrying over 1,000 tons of coal that leaves Shanxi for other places throughout the country.

These encouraging results were scored because Shanxi Province has conscientiously implemented the policy of adjustment of the national economy, given full play to the superiority of its coal resources, and accelerated the building of a base of coal energy resource. Through the effort of the coal staff members and workers throughout the province, in 1979, the annual coal output of this province surpassed the 100 million ton target for the first time. In the following 2 years, coal production continued to increase progressively by an average of some 11.8 million tons annually. Now, the province has built a strong coal production body of large, medium size and small coal mines that yields over 130 million tons of coal every year. Its daily coal output is equivalent to a medium size coal mine that yields 350,000 tons of coal a year. The coal production enterprises throughout the country can bring about 1.7 million yuan of profit to the country daily.

Shanxi Province has very abundant coal resources, and has all along been known as the "home village of coal." Since the 3d Plenary Session of the party, the Shanxi CPC Committee and the provincial people's government conscientiously implemented the strategic decision of the party Central Committee and State Council in building Shanxi into a powerful base of coal energy resources in the country as quickly as possible. Taking into consideration the reality, they put coal excavation and construction in an important position in the province's economic development. In light of the critical lack of state construction funds, from 1979 to 1981, the province successfully drew from the local funds some 277 million yuan, which were used in the building of new mines and in the technical transformation of old mines. At present, the building of some large mines such as the Taiyuan Gjuao Mining

District and the Datong Yanzishan Coal Mine is being stepped up. Some large and medium size mines such as the No 2 coal pit of the Liuwan Coal Mine under the Fenxi Mining Bureau and the Yuanbai Coal Mine under the Huo Country Mining Bureau have been completed and have plunged into production. The technical transformation of some old mines has also produced success. In the past 3 years, the scale of building mines reached some 27 million tons, with newly increased production capacity and comprehensive production capacity of over 14 million tons. Between January and July this year, they have overfulfilled the state plan for raw coal production by 7.62 million tons. A new phenomenon has emerged in coal production construction.

While grasping well coal production and construction, Shanxi Province also made great effort in doing a good job of transporting coal to other places, and tried its best to carry more coal to over 10,000 consumers in more than 20 provinces, municipalities and autonomous regions throughout the country. In the first half of this year, Shanghai faced a crisis in coal supply. After understanding the situation, the economic leading departments in Shanxi Province immediately took the initiative to cut down the volume of transport of the province's local goods and materials and increased the transportation of coal to Shanghai by over 200,000 tons. They were commended by the Shanghai municipal leading organs. Since the beginning of this year, the percentage of coal in the total freight volume on the Shanxi railroad is increasing monthly. At the beginning of the year, it was 80 percent and by June, it was 89 percent of the total. In the first half of this year, the province exported over 6.72 million tons of coal to other places. Recently, the State Economic Commission commended Shanxi for having made tremendous contributions in producing more coal and transporting more coal.

At present, the 350,000 coal workers in Shanxi are embracing full revolutionary fervor, combatting the high temperature and the rainy season in yielding more coal and transporting more coal, so as to welcome the victorious convocation of the 12th Party Congress with outstanding results.

9335
CSO: 4013/33

TARGET FOR DATONG COAL: 30 MILLION TONS BY 1985

Beijing MEIKUANG GONGREN [COAL MINER] in Chinese No 10, 1982 pp 5-6

[Article by Xiang Baohuang [0386 1405 3874], representative to the CPC 12th Party Congress and chief engineer, Datong Mining Bureau: "A Heartening Policy Decision"]

[Text] I attended the CPC 12th Party Congress as a representative of the Shanxi Province coal front and I am very excited.

In his report, Comrade Hu Yaobang summarized the historical victory achieved in the 6 years since the crushing of the "gang of four" and clearly defined the total task and overall target of struggle of the party during the new historical period. Looking back to the period since the Third Plenary Session, the party and state have shifted the emphasis of our work to economic construction and to the development and conservation of energy resources to satisfy the needs of national economic readjustment. This is entirely correct.

Our Datong Mining Bureau has conscientiously and thoroughly carried out the party line, principles and policies established since the Third Plenary Session, thoroughly and firmly engaged in the technical reconstruction and expansion of old mines, thoroughly engaged in implementing the policies of readjustment, reform, reorganization and improvement, reorganized enterprises and readjusted and strengthened the two levels of leadership groups of bureau and mines, thoroughly fulfilled the readjustment work with implementing the policy on coal mining technology, eliminating major hidden safety hazards, and improving the mining and development relationship as its principal elements, thoroughly carried out the policy of distribution according to labor, and implemented multiple types of economic responsibility systems. At the same time, starting with the actual conditions of our bureau and developing scientific research surrounding the key problems in production and hard roof research, we have vigorously developed mechanization of extraction, tunnelling and haulage, especially fully mechanzied extraction. In 1979, raw coal production was 24.05 million tons, an increase of 4.43 percent over 1978. Profits turned over to the state were 290.13 million yuan, an increase of 58.1 percent over 1978. In 1980 and 1981, production showed some steady increases over the level of 1979. Profits turned over to the state also showed greater increases and production safety achieved the best level in the

history of our bureau. The overall production capacity of the mines under the bureau reached 23.50 million tons. The technical appearance of the mines showed a notable change. The degree of mechanization of mining reached 65.88 percent, with fully mechanized mining reaching 46.17 percent. The production situation is even better this year. From January to August, a total of 17.69 million tons of coal was produced, completing 69.37 percent of the year's state plan. It is estimated that the state plan for the year will be exceeded by 500,000 tons and actual output will be 2 million tons above last year. It is estimated that profits to be turned over to the state will be over 310 million yuan for the year. These facts prove that the party line, principles, and policies established since the Third Plenary Session are entirely correct.

In his report, Comrade Hu Yaobang clearly defines that in the next 20 years we must take a firm hold on the basic links of agriculture, energy resources and communications and education and science and treat them as our strategic priorities of economic construction. This is a heartening policy decision which we support completely and will thoroughly carry out with determination.

Coal is our country's principal energy resource. With the development of the national economy, the demand for coal by the state will become greater and greater in the future. This is a glorious and difficult task presented by the party to all its members and the staff and workers on the front of the coal industry. As a party member on this front, I must exert all efforts to do well in my work and fulfill my own contribution to this task. Our Datong Mining Bureau is a large coal base in Shanxi and also in the country. To satisfy the demands of the state for energy resources, there must be great developments and great changes in the next 20 years. Our initial plan is to continue the thorough implementation of the principles of readjustment, reform, reorganization and improvement; with the existing 13 producing mines as the foundation and the improvement of economic benefit as the goal, to continue to carry out overall technical reconstruction and expansion of the mines separately; to carry out the resources exploration work of the Datong coal field, properly conduct the development work in the mining region, engage extensively in scientific research work, and accelerate the construction of the large new mines being constructed in the mining region; to transfer backbone technical personnel and technical workers to support the development of the large Pingshuo open pit mine; to vigorously develop the training work for all personnel; and to overcome the difficult hard roof management problem, tackle and develop totally mechanized mining, and improve production safety measures. This will make it possible for the coal production and construction in our bureau to meet the needs of the state and to steadily achieve a healthy development. We must endeavor for our raw coal production to reach 30 million tons in 1985 in order to provide greater quantities of coal for our country's gross industrial and agricultural production value to quadruple by the end of this century and make a greater contribution for the realization of our socialist modernization construction.

5974
CSO: 4013/42

MORE POWER PLANTS, RAILROADS FOR SHANXI COAL BASE

HK220116 Beijing CHINA DAILY in English 22 Dec 82 p 4

[Text] Shanxi Province has 200 billion tons of coal, one-third of the coal resources in China. The province's coal production in terms of quality, quantity, and variety, ranks first in the nation.

Shanxi's coal mines are quite industrialized and have a huge labour power. Many rural agricultural communes have small coal mines as their sidelines. There are now 2,171 of these mines and they produce some 40 million tons of coal annually.

More than 70 percent of Shanxi's coal production last year--some 132 million tons--was transported to other provinces and industrial centres all over China.

But Shanxi's coal industry lacks technical manpower, especially geologists and mining engineers.

In order to increase its production, Shanxi is going to step up technical renovation of old mines, as well as construction of new mines. The Shigejie Coal Mine, for example, which used to be very small with an annual output of some 20,000 tons, now produces 900,000 tons of coal each year.

Technical renovation will start in some 130 existing mines, and in some 200 small mines run by rural collectives.

Tian Yuqi, a senior engineer from the Coal Mine Design Institute of Shanxi, has called for improving miners' working conditions, and welfare. Some mines now have difficulty recruiting new men and miners have problems in finding spouses, he said.

The limited transportation facilities now pose a great obstacle to the further development of Shanxi's coal industry. There are about 10 million tons of coal which cannot be delivered on time to importers of Shanxi coal.

The central government has decided to build double track and electrify three major railways to speed the export of Shanxi coal. By 1990, as planned, coal transportation capacity will be doubled.

Another way to ease the transportation problem is to build more power stations and place industries with high energy consumption in Shanxi. Large power stations, fertilizer plants, electrolytic aluminum manufacturers and other industrial enterprises are being constructed in Shanxi.

Because of technical defects in China's high-tension grid, power from Shanxi can only reach cities like Beijing, Tianjin, Tangshan and Handan in Hebei Province, Zhengzhou in Henan Province and Jinan in Shandong Province.

Hebei and Henan are also coal-producing provinces. Their output can be transported to the south to ease some of Shanxi's burden.

Under the guidance of the Ministry of Water Conservancy and Electric Power, Shanxi plans to divert the Huang He to provide its industry with sufficient water.

"This is an expensive project," Tian said, "but we must complete this job. Otherwise, an unsurmountable difficulty will face shanxi's coal industry in the due course."

CSO: 4010/29

COAL

NEW RAIL NETWORK WILL BOOST COAL SHIPMENTS

OW270905 Beijing XINHUA in English 0824 GMT 27 Nov 82

[Text] Beijing, November 27 (XINHUA)--China is building a railway network to ship coal from major producing centers of Shanxi, and the neighboring Hebei and Henan provinces and the Nei Monggol autonomous region, the Ministry of Railways reported.

The network, to be completed after 1985, will accelerate the shipping of coal from the fields in north China to other parts of the country and to ports for export.

New, double-track and electric railways and railway hubs are under construction in north, central and east China, the ministry said.

Upon completion, Shanxi Province--China's largest coal producing center--will be able to ship 120 million tons of coal, compared with the present 80 million tons. The province, which produced 130 million tons of coal in 1981 or one-fifth of the country's total, plans an annual average increase of 10 million tons in the next few years. Its verified coal reserves are estimated at 202,000 million tons, roughly one-third of the national total.

Construction of roadbeds and tunnels is now nearing completion for the 379-kilometer electric, double-track railway from Datong, a major Shanxi coal producing center, to Beijing's suburban Fengtai, the ministry said. The railway will be connected with another double-track, electric railway from Beijing to Qinghuangdao, a port city in neighboring Hebei Province.

Tracks are being laid for the western section of the 280-kilometer, Beijing-Qinghuangdao railway, which will serve as a vital line for shipping Shanxi's coal to China's coastal areas and for export.

China's first electric, double-track railway opened in September from the Shanxi provincial capital of Taiyuan to Shijiazhuang, capital of Hebei Province. Double-tracking of the railway from Shijiazhuang to Dezhou City in neighboring Shandong Province is expected to be completed this year, it said.

About 170 kilometers of double tracks have been laid for the railway from Shandong provincial capital of Jinan to the seaport city of Qingdao. Construction

is well under way on the 300-kilometer railway from Yanzhou--a coal producing center--to the port of Shijiu, in Shandong. The port is designed for coal export.

Construction is scheduled to start in 1983 on the railway from Xinxiang City, Henan Province, to Heze in Shandong, to be connected with the Yanzhou-Shijiu line, the ministry reported.

In addition, railway hubs serving these lines are being built in Taiyuan, Shijiazhuang, Dezhou, Jinan and Xuzhou City in Jiangsu Province. The hub in Zhengzhou, capital of Henan Province, is nearing completion on the east-west Longhai railway.

CSO: 4010/24

HEBEI HOLDS CONFERENCE ON COAL PRODUCTION, TRANSPORT

HK141508 Shijiazhuang Hebei Provincial Service in Mandarin 0400 GMT 6 Dec 82

[Text] Yesterday evening, the Hebei Provincial Economic Commission and the coal bureau joingly held a telephone conference, calling on the staff and workers on the coal front and of the communications and transport departments to arouse their enthusiasm, step up the production and transport of coal and guarantee the generation of electricity and the fulfillment of the annual quotas for industrial production.

Vice Governor Yue Zongtai spoke at the conference. He first analyzed the situation in our province's industrial and communications production. He said: Since the beginning of this year, staff and workers on the industrial and communications front have seriously implementated the spirit of the National Conference on Industrial and Communications Work and the spirit of the 12th Party Congress, corrected guiding ideology, shifted the key point of the work of the whole party to economic construction and brought the key point of economic work in line with raising economic results as the center. Production has increased steadily, the majority of quotas for economic results have been fulfilled better, the work of straightening out enterprises has developed healthily and the situation has been good. Judging from the current situation in production, the task of maintaining an increase of 4 percent and striving for 5 percent in production is very arduous and there are many difficulties and problems. We must work very hard to achieve this. We must not lower our guard or be careless.

At present, we are confronting an extremely serious problem in industrial production. That is, coal is in extremely short supply, resulting in some powerplants being unable to supply sufficient electricity. This has caused shortages of electricity and affected industrial production. If this situation continues to develop, there will be no guarantee for fulfilling this year's plan for increasing production, and social stability certainly will be affected.

Comrade Yue Zongtai pointed out: Since the beginning of this year, the situation in coal production in the whole province has been good. Compared with last year, output and efficiency are higher; the quality of coal is better; there have been fewer injuries and deaths; consumption and costs are lower;

and profits are higher. Cadres, engineers, technicians, staff members and workers on the coal front have worked hard and should be commended and praised. However, we must pay great attention to the fact that at present, coal production is beginning to drop. Our province is a main coal producing province in our country and shoulders the glorious task of supporting the whole country. The supply of coal which our province has relied on is that coal which is produced after meeting its planned quotas. If coal production does not increase, this will aggravate difficulties within the province. Now, the short supply of coal is a crucial problem of whether or not the whole province can fulfill its quotas for industrial production. The only answer is to overfulfill the quotas for coal production, strive for production beyond quotas and use coal which is produced after quotas have been met to ensure the fulfillment of plans for maintaining an increase of 4 percent and striving for 5 percent in industrial production throughout the province. This is a glorious task which is confronting the staff members and workers of all coal mines throughout the province.

Comrade Yue Zongtai analyzed the reasons for being unable to increase coal production at present. They are mainly the existence of slack attitudes. He demanded that all staff members and workers on the coal front arouse their enthusiasm and immediately go into action. Leaders must take the lead and the masses must be mobilized to work hard in the last 20-odd days of this year, quickly improve the situation and strive to increase production beyond quotas. Communication and transport departments must guarantee transport of coal and promptly transport to enterprises all coal produced. The coal front and the communications and transport front must work hard, as must the other trades. In accordance with this spirit, all prefectural, municipal and county economic commissions and the industrial and communications bureaus and other bureaus of all prefectures and municipalities must do well in grasping production in December and ensure the fulfillment of the annual quotas.

Yue Zongtai said: While grasping yearend production well, we must make good preparations for next year's production. We must ensure that we make early arrangements for planning, supply of materials, examination and repairing of equipment and maintaining ties between industry and commerce.

(Zhong Jijiu), deputy director of the provincial coal bureau, spoke at the conference, declaring that under the leadership of the provincial CPC committee and the provincial government, comrades on our coal front must arouse enthusiasm, work hard, foster the sense of responsibility as masters of their own affairs, shoulder the glorious task of increasing coal production, support powerplants to increase production and support all walks of life and trades to guarantee the fulfillment of the quotas for industrial production throughout the province and to satisfy the needs of the people's livelihood.

CSO: 4013/88

COAL

GUANGXI REGISTERS INCREASED COAL PRODUCTION

HK030348 Nanning Guangxi Regional Service in Mandarin 1130 GMT 2 Dec 82

[Text] The region's coal production plan for this year has been accomplished 33 days ahead of schedule. By 28 November, 5.6 million tons of coal had been produced in the region. This is an 18 percent increase over the same period in 1981. The excellent situation in the region's coal production has been brought about by the following reasons:

1. Leaders at various levels have changed their work style. They have gone deep into the forefront of production to investigate, study and solve problems.

2. They have grasped well enterprise rectification. This year, all the mining bureaus and mines have centered on promoting economic results to emphatically rectify the leading ranks, economic responsibility system and labor organizations. Through the rectification, there has been notable progress in the economic and technical quotas of the regions' coal mines whose products are subject to unified distribution. From January to October, mine timber consumption for the production of every 10,000 tons of coal decreased by 6.7 percent, as compared with the same period in 1981. Composite power consumption decreased by 9.5 percent, full staff work efficiency increased by 11.6 percent and losses were reduced by 2 million yuan.

3. Activities to learn from and catch up with the advanced have been developed. Communist spirit has been promoted. This year, all the coal mines in our region have held advanced collectives and model workers representative meetings. A number of advanced models have been established and the masses of workers have been organized to learn from them. Encouraging changes in the workers' spiritual attitude have emerged.

4. The spirit of the 12th CPC National Congress has been implemented. Since the 12th CPC National Congress, many coal mines have held discussions on the question of what the coal miners should do in view of the necessity to quadruple the national economy. The masses of workers expressed that it is necessary to fulfill their duty, do their work well, quicken the pace in coal production and make more contributions to quadrupling the national economy. Since September, the region's coal production has been growing. The average daily production has increased by 11 percent, as compared with the preceding 8 months.

CSO: 4013/88

COAL

HENAN PROVINCE SPEEDS UP COAL DEVELOPMENT

OW281628 Beijing XINHUA in English 1506 GMT 28 Dec 82

[Text] Zhengzhou, 28 Dec (XINHUA)--A large coal mine, designed to produce 1.2 million tons annually, went into production today in the Yuxi Coal Field in western Henan Province, according to the provicial coal industrial department.

Construction of the Gengcun Mine began in 1975 and is part of the province's effort to develop the field, with cumulative verified reserves exceeding 12 billion tons, the department said.

The new mine is expected to have a life span of 120 years, with reserves verified at 260 million tons.

Another coal mine, named Jiulishan, designed for 900,000 tons annually in the same field, is expected to open soon, the department said.

Coal mined from the Yuxi Field--one of China's ten major coal fields--accounts for more than 95 percent of Henan's total output, estimated at 57 million tons in 1982, according to the department. The province expects to mine 110 million tons by the year 2000.

The field, which contains coking coal, fat coal, anthracite and other high-quality coal, is crisscrossed by railways and highways, the department said.

Five additional mines with a combined annual production capacity of 4.6 million tons are under construction in the Yuxi field. The No 8 Mine, designed for three million tons each year, is being built in Pingdingshan, a major coal-producing center. Its first stage project, with an annual output of 1.2 million tons, opened in 1981. Construction of the second stage project, designed for 1.8 million tons annually, is well under way.

Work on another five mines with a total annual capacity of 3.5 million tons is planned for 1983 and 12 more mines are being designed the provincial coal department said.

CSO: 4010/29

COAL

SICHUAN COAL PRODUCTION SETS RECORD LEVELS

Chengdu SICHUAN RIBAO in Chinese 11 Sep 82 p 2

[Article by staff reporter Yan Weipian [0917 3634 7478]: "The Staff Members and Workers of Our Province's Coal Front Work To Produce More and Better Coal"]

[Text] The broad masses of staff members and workers of our province's coal industrial front, full of enthusiasm, celebrated the victorious convening of the 12th Party Congress by producing more and better coal. Between 1 and 5 September, the 14 key coal bureaus and mines throughout the province have produced 3,200 more tons of raw coal as compared to the corresponding period the month before.

The good news of the convening of the 12th Party Congress has greatly inspired the production enthusiasm of the broad masses of staff members and workers on the coal front. The staff members and workers of the Dukou Mining Bureau proposed that: In the days of the convening of the 12th Party Congress, the daily output of raw coal in the entire bureau will surpass 10,000 tons. The staff members and workers fought arduously. In the first 5 days of September, in 2 days, they succeeded in surpassing the 10,000-ton target. In these 5 days, they overfulfilled the state plan by 12 percent in average daily output. Since the opening of the 12th Party Congress, the staff members and workers of the Nantong Mining Bureau overfulfilled their plan every day and continued to set new records. The No 113 coal excavation team of the Donglin Coal Mine under that bureau increased its daily output from some 400 tons to some 600 tons. The No 151 and 171 coal excavation teams of the Nantong Coal Mine and the No 122 and 124 coal excavation teams of Yanshantai Mine have also successively set records since the beginning of this year. The staff members and workers of the Da County Mining Bureau overcame the difficulties in transportation. Between 1 and 5 September, the raw coal output of the entire bureau increased by 40 percent over the same period the month before. The Tianfu Mining Bureau fell behind in production in the last 2 months. Inspired by the spirit of the 12th Party Congress, the staff members and workers roused their spirit and creased a new situation. Between 1 and 5 September, the average daily raw coal output of the entire bureau was 3,610 tons, overfulfilling the state plan by 7.8 percent.

9335
CSO: 4013/33

NEI MONGGOL REPORTS COAL PRODUCTION PROSPECTS

SK300356 Hohhot Nei Monggol Regional Service in Mandarin 1100 GMT 29 Nov 82

[Text] Presently, there are seven or eight trains fully loaded with coal running every day from our region to the northeast and east areas of China to support their power brids to generate electricity. Over the past 3 years, the region has transported about 20 million tons of coal to these areas, averaging 7 million tons a year. In addition, the coal consumption for smelting and power generation of the large power and iron and steel enterprises of the central authorities in our region amounts to about half of our region's total output.

This year the masses of workers on the coal front have tried every possible way to increase coal production to support the state's four modernizations. From January to October, all our region's coal mines produced 18.56 million tons of raw coal, 9.8 percent more than in the corresponding 1981 period. During the same period, the raw coal transported to outside the region totaled about 6 million tons.

Our region is abundant in very rich coal resources. Verified reserves have reached 194 billion tons, ranking second in the country. The state has decided to accelerate the exploitation of the coal resources in our region. By the end of this century, our region's coal output will octuple the present figure and we will become the second largest coal energy base of the country, next to Shanxi only. Following the exploitation of new coal mines, our region will make greater and greater contributions to the four modernizations with more coal.

CSO: 4013/88

PROBLEMS IN USING BONE COAL IN POWER GENERATION IRONED OUT

Beijing DIANLI JISHU [ELECTRIC POWER] in Chinese No 8, 5 Aug 82, pp 21-25

[Article by Shen Dunming [3088 2415 2494] of the Hunan Institute of Electric Power Survey and Design: "Experience of Burning Bone Coal With Fluidized-bed Boiler and Fly Ash Utilization"]

[Text] Hunan Province has a rich reserve of bone coal, 20 billion tons according to the Ministry of Geology and Minerals statistics, and mostly distributed in areas short of coal. The development of this low heat value energy resource is therefore one of the solutions to the energy shortages in areas short of coal in Hunan Province.

Nijiangkou in north-central Hunan, located 90 kilometers from Changsha, is an extension of the Xuefeng Mountains bone coal belt and has a rich reserve of bone coal. The bone coal seam in this area is 11 kilometers long, 3~4 kilometers wide and 8~150 meters thick. The thickness is mostly in the 20~40 meter range and open mining can be used at shallow locations. Preliminary surveys show a reserve of more than 1 billion tons.

Bone coal is a carbon-containing shale existing in ancient strata formed from the accumulation of algae in shallow seas after a period of reduction and change. It contains organic matter with hydrocarbons, oxygen, nitrogen, phosphorus, and sulphur. Like other types of coal, bone coal also contains inorganic matter such as mineral impurities and water (see Table 1).

Table 1. Principal composition of Nijiangkou bone coal

Composition	C^y	H^y	O^y	N^y	S^y	W^y	A^y
Content (%)	10.61	0.21	0.886	0.162	2.324	5.56	80.248

The difference is that bone coal contains fewer hydrocarbons and more mineral impurities, has a lower heat value and a higher ash content. In addition, it also contains associated elements such as rare and precious metals of vanadium, nickel, molybdenum, germanium and uranium. Bone coal forms slate, dense with a Brinell hardness of 8~12 and is black or dark gray in color. Some bone coal have conchoidal fracture. Bone coal seams are quite stable, but some exposed deposits tend to ignite spontaneously.

I. Power Generation From Bone Coal

The Yiyang bone coal power generation and integrated utilization experimental plant (formerly the Plant 925 project) is located in the Nijiangkou bone coal zone and is an integrated experimental project.

The integrated utilization plant has a bone coal burning power generating station equipped with a 35 ton/hour boiling furnace and a 6000 kw turbine generator. In order to utilize the cinder and ash discharged from the boiler furnace, a building material plant was built which has an annual yield of 20,000 tons of raw cement, 10,000 tons of bonding cement, 10,000 tons of conventional cement, 250,000 pieces of flat tile and 5000 cubic meters of block. The vanadium plant produces 25 tons of vanadium every year. The associated bone coal mine produces 300,000 tons of bone coal every year. The electric power plant is adjacent to the building material plant and the vanadium plant and is approximately 300 meters from the open mineshaft.

The boiler furnace was designed by the Shanghai Boiler Institute and produced by the Shanghai Boiler Plant. It has a twin-D bubble structure.

The specified evaporation rate of the boiler is 35 tons/hour, the pressure of the overheated steam is 39 kg/cm^2, the temperature of the overheated steam is 450°C, the temperature of the boiler bed is 905°C. The boiler was designed to use 1092 kilocaloric/kilogram bone coal and the designed thermal efficiency is 62.2 percent.

The steam turbine is a model N6-35-1 vapor condensation type machine with a quoted output of 5000 kw. The intake pressure is 35 kg/cm^2, the steam temperature of 435°C and the turbine was manufactured by the Qingdao steam turbine plant. The generator is a model QF-6-2 electric generator with a specification power of 6000 kw and a specification voltage of 6,300 volts.

Coal feeding system: The bone coal are elevated through the mine shaft by light-rail barrel car and hoist and then slide freely into the coarse cinder storage bin in front of the power plant. They are subsequently broken into grains of 100 millimeters or smaller by a 400x600 jaw-type crusher and then fed into the coal transport system of the power plan.

Dust removal system: The lower section of the boiler makes use of a surface type cinder residual heat recoverer. The overflow cinder coming out of the boiler overflow port is at a temperature of 900°C; after passing through the surface type residual heat recoverer, the temperature is lowered to 450~500°C. It is then discharged from the electromagnetic vibration feeder through two channel. In one channel, the free flow of water flushes the cinder to the front pool of the ash-and-cinder pump and the 4 PH [sic] ash cinder pump then delivers the cinder to the ash dump in a valley 700 meters from the plant site. In the other channel, the cinder is delivered by negative air pressure to the storage of the building material plant 50 meters from the boiler room.

Dust removal: The dust removal is accomplished by a two-stage series of dry type 900mm diameter motor dust remover and a wet type 2,500mm diameter water film dust remover. After dust removal, the smoke is then fed into a 60-meter tall chimney by an inducted draft fan and discharged into the atmosphere.

Water supply: The water supply employs a closed circulation system. The natural ventilation cooling tower (a brick and concrete structure) is 34 meters tall, 32 meters in diameter at the base and 12 meters in diameter at the top. The water pool is 1.5 meters deep and has a shower area of 250 square meters. An auxiliary water pump was built on the bank of the Zhixi River 500 meters from the power plant.

Water treatment: The water is treated with a precipitation-filtering-sodium ion exchange system.

From March 1978 to May 1981, the boiler has been fired up 76 times. The early stage of the test run has revealed some of the problems existed in the equipments and in the design. For example, the furnace interior temperature was too low, the superheater overheated, the overflow of cinder did not discharge properly, the free-flow ash trough backed up, the input pipe of the ash and cinder pump was frequently plugged and the output valve could not be opened fully (because the motor drew excessive current with the valve fully open), and the valve wore off rapidly and required replacement every 24 hours. After a dozen major revisions, some of the equipment and design problems were resolved. The major improvements were: reducing the heated area of the buried pipe from 60.24 square meters to 19.67 square meters, reducing the area of the superheater from 298.5 square meters to 191.56 square meters, reducing the diameter of the wind cap hole from 5.2 millimeters to 4.5 millimeters and increasing the wind speed from 29.4 m/sec to 34.6 m/sec, changing the opening of the ignition oil gun from a 20° flare to a straight cylindrical opening, drilling a 1.9 millimeter hole at the center of the oil gun distributor disk to increase the range and the rigidity of the flame, reducing the diameter of the stable burner from 180 millimeters to 110 millimeters, changing from electromagnetic vibrator coal feeder to belt feeding, changing the grade of the cinder trough from 1.5 percent to 2.3 percent, changing the lining of the cinder trough from granite to diabase and adding flushing nozzles along the trough, changing the shape of the front pool of the ash and cinder pump from rectangular to funnel-shated in order to eliminate precipitation dead spots when the pumps are not running, and extending and elevating the discharge pipe of the ash pump to correct the problem of not being able to close the valve fully. After these modifications, the 35 ton/hour boiler furnace was able to sustain stable burning even using bone coal with a heat content of 900 1100 kilocalorie/kilogram.

Because bone coal has a low heat output, the consumption of bone coal in a boiler is 5 times greater than conventional coal for the same boiler capacity and operating conditions and the ash discharge is 15 times greater. For a boiler furnace, the requirement of the grain size of the input bone coal is very strict. It is generally required to be less than 8 millimeters;

for grains greater than 8 millimeters in size, the boiling is impeded by the limitation of air pressure and air flow and they are difficult to burn. These large grains not only release no heat, they actually carry away some of the heat energy. Grains less than 0.5 millimeter in size are swept away by the smoke and gas flow as soon as they enter the furnace. The grain size produced by the fuel preparation system should therefore be uniform and the output volume should be large.

The industrial analysis of the Nijiangkou bone coal shows that the compositions are 3.9~4.66 percent of W^y, 13~14.3 percent of C^f, 1.7~2.27 percent of V^f, 82.8~83.1 percent of A^f; and the Q^y_D value is 980~1019 kilocalorie/kilogram. Table 2 shows the screening characteristics of the input bone coal grains.

Because a high capacity counter-impact crusher suitable for coal ballast was unavailable at the time the power plant was designed, two Ø 1000x700 single-rotor counter-impact crushers with an output of 15~30 tons/hours were installed in the crushing machine room to meet the testing needs. A model SZG 1500x3000 resonant sieve was also installed.

Table 2. Screening characteristics of the bone coal grains fed into the furgnac

Grain size	9~5	5~4	4~3.2	3.2~2.5	2.5~2	2~1.8	1.8~1.2.5
Percent	23.8	12.06	9.1	11.9	7.1	13.6	11.1

1.25~0.63	0.63~0.4	less than 0.4
2.14	6.2	3

According to the design requirement, the grain size of the coal entering the power plant from the coal mine should not exceed 100 millimeters. But in the initial phase of the test run, the jaw crusher was not yet in operation and the coal grains were feed into the power plant regardless of size; some pieces were as large as 300~500 millimeters in size. The drum sieve at the power plant could not withstand the impact of the large chunks of coal and was quickly damaged and had to be taken out. As a result, coal pieces of all sizes were fed into the counter-impact crusher and caused serious wear of the hammer. The hammer head had to be replaced every 8 hours or so, the noise level and the blast volume were high and the coal dust flew badly. The output of the crusher steadily deteriorated and could no longer meet the demand of the normal operation of the boiler and the boiler had to be operated intermittently. The output of the fuel preparation system became the crucial factor affecting the normal operation of the 35 ton/hour bone coal boiler furnace. After the jaw type crusher were put into operation later, the system still could not meet the daily coal consumption of the boiler even though the output was increased, the wear was reduced and the hammer needed less frequent replacement. In order to search for more suitable bone coal crushing equipment, the Hunan Institute of Electric Power

Survey and Design and the power plant conducted their investigation and adopted the first 2PF1010 dual-rotor counter-impact crusher manufactured by the Shanghai Heavy Machinery Plant as the principal coal crushing facility of the power plant, replacing the 400x600 jaw crusher at the coarse crushing room.

The 2PF1010 dual-rotor counter-impact crusher has a rotor diameter of 1000 millimeters and a rotor length of 1000 millimeters. The rotational speed of the first stage rotor is 574 rpm and the rotational speed of the second stage rotor is 880 rpm. The input grain size is 450 millimeters, the output grain size is less than 20 millimeters and the maximum output is $60 \sim 80$ tons/hour. This crusher was put into operation in October 1980 and crushed $60 \sim 70$ tons of bone coal per hour. It has fundamentally turned around the passive situation of coal feeding system not meeting the boiler's need and provided a sustained basis for long-term operation of the power plant.

II. Economic effects of bone coal power generation technology

After a number of improvements, the 35 ton/hour boiler can now routinely burn bone coal with a Q_D^Y of $900 \sim 1100$ kilocalorie/kilogram. In the 25th test run, the generator operated for 1124 hours and 28 minutes uninterrupted with the output power stabilized between economic load (85 percent of rated load) and rated load. The major operating data are listed below:

Power generated	5,733,120 kilowatt hours (4,682,504 kwh fed into power grid and 84,159 kwh used by auxiliary enterprises)
Average load	5,098.52 kilowatts
Percent of power consumed by the plant (a total of 966,457 kilowatt hours)	16.86 percent
Bone coal used per kwh of power generated (A total of 34,297.46 tons of bone coal was used, including ignition use and loss)	5.66 kg/kwh
Average heat output of bone coal	890 kilocalorie/kilogram
Standard coal consumption per kwh of power	707 gram/kwh
Boiler efficiency	65 percent
Unit price	0.08 yuan/kwh

As we have discussed earlier, because bone coal has a low output of heat energy and a high ash content, the crushing, sifting and delivery system and

the dust removal and ash discharge facility must have a greater capacity and the power of the blower and venting system must also be larger, as a result, the plant uses more electric power. In this 1000-hour continuous operation, the percentage power consumption by the plant was 16.86 percent. The breakdown is as follows: 2.89 percent for the blower, 1.89 percent for the vent, 2.65 percent for the crusher and coal feeding system, 3.14 percent for the dust removal and ash discharge system, 2.15 percent for the riverside pumping facility and 4.13 percent for other items.

The percentages of power consumption by the plant quoted above are actual data under 85 percent load of the generator. If the generator were operated at full load, then except a slight increase in the power usage by the coal feeding system and the ash and dust system, other increases would have been negligible. The power consumption by the plant at full load therefore decreases to 15.5 percent or so. If the present water supply, ash flushing, operation adjustment and blower and venting system are further improved and if the rotational speed of the second-stage crusher or a high-speed single-stage facility is used to replace the current two-stage system, the percentage power consumption by the plant is expected to decrease some more.

We now address the issue of the cost in bone coal power generation. Since the generator is still in the test run phase and no data are available for whole year continuous operation, we shall figure the cost based on the actual expense, the amount of power generated and delivered and the power consumed by the plant for the continuous 1000 hour operation. Depreciation and cost for major maintenance are calculated assuming 4000 hours of running per year. The cost for power generation comes out to be 0.0639 yuan/kilowatthour and the cost for delivery is 0.768 yuan/kilowatthour.

Principal reasons for the high cost of power generation and remedies:

1. Large consumption of coal. The heat value of the surface seam coal ballast at Nijiangkou open pit mine is relatively low, with a Q_D^Y value less than 1000 kilocalorie/kilogram. As a result, the generator cannot be operated at full load, the thermal efficiency is low and the plant consumption of electrical energy is high. If the average heat value of the coal ballast entering the boiler can be raised to 1000~1100 kcal/kg, then the coal consumption may be reduced from 5.56 kg/kwh to 4.5~5 kg/kwh and the cost can be reduced by 5 to 6 percent.

2. Testing indicates that burning in the boiler is incomplete and there is substantial heat loss, approximately 12.1 percent, out of which 5.94 percent is due to mechanical incomplete burning caused by fly ash. This is mainly because 10 to 15 percent of the coal ballast particles fed into the boiler are less than 0.5 mm in size. These coal dust particles are swept out of the boiler by smoke either before they are ignited or as soon as they are ignited in the suspension stage. Measurement shows that their heat value is still as high as 630~670 kcal/kg after they settled in the dust remover. If the air current is stronger, even more of the coal dusts are carried out. These coal dust particles not only provide no heat release but also carry

away part of the heat energy in the boiler. In view of this condition, the amount of coal dust less than 0.5 mm should be kept to a minimum in the sifting process, or they should be separated before entering the boiler for other uses, such as spontaneous ignition internal heating bricks or concrete additive. In the meantime, further tests and investigation should be made to find the optimal method of burning bone coal and reduce the heat loss and coal consumption.

In addition, the option of running one generator with two alternating boilers should also be considered to strive for generation at full load and reduction of plant consumption of electricity. However, adding facility would require a greater investment and the cost will also be affected, this must be determined by calculation.

Based on the discussion above, the current technical and economic target of generating electricity by burning bone coal can still be improved.

In order for bone coal power generation to be viable, integrated usage must be taken into account simultaneously. For example, the 35 ton/hour boiler at the Yiyang Power Plant burns more than 30 tons of bone coal per hour and the ash content of the coal is 82.83 percent. Without integrated utilization, a large area of land will become an ash dump for the discharged ash cinder and the environment will be badly polluted. The integrated utilization experimental plant of the Yiyang bone coal power plant has now established various enterprises for the integrated utilization of bone coal ash and cinder and has acquired some production capability. Test production has shown that integrated utilization of ash and cinder has prominent economic values. A building material plant, for example, can process 60,000 to 70,000 tons of ash and cinder at sustained running and the annual profit may reach 160,000 yuan or so. This would on the one hand reduce the burden of ash storage at the power plant and on the other hand partially offset the expenses of the power plant by the profits of the building material plant.

Using bone coal as an energy source, the coal consumption of the integrated enterprise amounts to 841.6 grams of standard coal per kilowatt hour of electric energy. Compared to the average coal consumption of 453 gram/kilowatt hour of domestic plants of 6000 kilowatt capacity or greater, burning bone coal consumes 7000 tons of standard coal per year. This calculation did not take into account the energy saving from integrated utilization and it should compensate for the extra coal consumption of burning bone coal.

The following considerations must be taken into account in building an economically viable bone coal integrated utilization power plant:

1. Build the power station at the mine site to reduce transportation costs.

2. High heat content bone coal (1100 kcal/kg or greater) should be used first.

3. Coal mines that have a rich reserve and are easy to mine should be selected to reduce the investment of building mine shafts and the costs for mining.

4. The capacity of the boiler should not be too large, two generators and two boilers would be the best. The total capacity should not exceed 12,000 kilowatts because the coal feeding and cinder discharge systems should not be too unwieldly.

5. Integrated utilization of ash and cinder should be considered simultaneously.

9698
CSO: 4013/150

COAL

BRIEFS

HEBEI COAL MINE OPENING--Shijiazhuang, 29 Nov (XINHUA)--A coal mine with a designed capacity of 900,000 tons annually has started production in the Handan-Xingtai Coal Mining Center in southern Hebei Province. According to the provincial coal industrial department, the new mine, named Xiandewang, is planned to have a life span of more than 100 years. All equipment in the new mine was produced domestically. Construction took less than 6 years, the department said. Hebei Province ranks second in China in coal output--51.8 million tons in 1981--next only to neighboring Shangxi Province and first in the country in washed coal output--11.67 million tons last year. The province is now building 7 medium-sized and large coal mines with a total annual production capacity of 12.16 million tons. The opening of these new mines will help boost Hebei's agricultural and industrial production and coal export. The province's long-range plans include 21 new coal mines with a total annual production capacity of 25.1 million tons by the year 2000, and 8 coal washing plants with a combined annual capacity of 18.9 million tons. [Text] [Beijing XINHUA in English 0229 GMT 29 Nov 82 OW]

HEBEI COAL EXPORT PORT--Shijiazhuang, 11 Nov (XINHUA)--Construction of modern coal wharves is proceeding at a rapid pace at Qinhuangdao Harbor, China's largest coal export facility in Hebei Province, harbor administration officials reported. The project calls for construction of 4 berths with a total investment of 500 million yuan. When completed, the installation is expected to at least treble the harbor's annual coal handling capacity of 15 million tons. The first phase of the project includes a 547-meter-long wharf, a berth designed to accommodate 20,000-ton class ships and another berth for 50,000-ton freighters, 2 piers and a yard for 500,000 tons of coal. Installation of heavy loading and unloading facilities as well as sic belt conveyers is nearing completion. The berths are expected to handle 10 million tons of coal yearly on completion next June. Phase 2 of the project consists of a wharf 615 meters long and two berths designed for 50,000-ton-class vessels. The berths, scheduled for completion by the end of 1984, will have an annual handling capacity of 20 million tons of coal, for which workers are now constructing 1,000-ton caissons. [Text] [Beijing XINHUA in English 0714 GMT 11 Nov 82 OW]

ANHUI COAL MINE GROWTH--Hefei, 26 Nov (XINHUA)--Construction of one of China's largest coal mines in Anhui Province with a designed annual capacity of 4 million tons has just started, according to the provincial industrial department. The Xieqiao Coal Mine, located in Vingshang County in northern Anhui,

has a reserve of 870 million tons of high grade coal. Excavation is being carried out, and a railway line and roads leading to the mine have been completed. Power transmission lines, telecommunications and water supply facilities have been built, the department said. The area has a complicated geological structure with a thick leaver of earth and rock above the coal seams and shifting sand underneath that could cause cave-ins. Workers are working three shifts a day to speed up the construction of the project, and will use the "earth freezing" method, that is, they will use ammonia as the refrigerant to freeze the overlying earth as they sink the six shafts. [Text] [OW040429 Beijing XINHUA in English 0804 GMT 26 Nov 82]

HEBEI COAL RAIL LINE--Shijiazhuang, 10 Dec (XINHUA)--A 174-kilometer railroad was put into operation today in Hebei Province, completing a double-track project to ship more coal from the country's biggest coal producer, Shanxi Province. The double-track railway line from Shijiazhuang, capital of Hebei Province, to Dezhou, a city in Shandong, will increase railway transport volume between industrial regions in east China and Shanxi Province, which in 1981 produced 130 million tons of coal, about 1/5 of the national output. A 235-kilometer electric, double-track line, China's first, opened last September, linking Shijiazhuang with Taiyuan, capital of Shanxi. Construction is under way for a railway network to help transport coal from Shanxi and neighboring Hebei and Henan Provinces and Inner Mongolia Autonomous Region. Upon completion of the project in 1985, railway authorities said, an annual average of 120 million tons of coal will be transported out of Shanxi for consumption in other parts of China and for export, compared to 80 million tons at present. [Text] [OW221401 Beijing XINHUA in English 0948 GMT 10 Dec 82]

CSO: 4010/29

HUNAN COAL PRODUCTION--Since the 3d Plenary Session of the 11th CPC Central Committee, the Hunan Provincial coal system has carried out rechnical transformation in old coal pits in a planned and systematic way, improved their conditions for production and increased their capacity for production. From 1979 to 1981, the system carried out technical transformation in 59 pits. Since transformation, their capacity for production has increased from 590,000 tons in the past to 2.66 million tons now. Realizing the advantages of technical transformation in old coal pits, this year governments at all levels and coal departments in all places throughout the province have actively raised funds to carry out technical transformation in 19 prefectural and county coal pits and 54 small commune and brigade coal mines. Since transformation, these coal pits and small mines have increased their capacity for production from 816,000 tons to 2.1 million tons. [Text] [Changsha Hunan Provincial Service in Mandarin 1100 GMT 16 Nov 82 HK]

HUNAN COAL DEPOSITS--Since the 3d Plenary Session of the 11th CPC Central Committee, the Hunan Provincial Coal Prospecting Company has discovered some 246 million tons of coal deposits. The prospecting footage from January to October this year amounted to 93,296 meters, which was more than the annual quota for prospecting footage. In this period, the company build 309 workable coal seams. [Text] [Changsha Hunan Provincial Service in Mandarin 1100 GMT 16 Nov 82 HK]

HUNAN FUTURE COAL PITS--In the period of the Sixth and Seventh 5-Year Plans, Hunan Province will build 51 new coal pits, whose designed capacity is 7.31 million tons a year. [Text] [Changsha Hunan Provincial Service in Mandarin 1100 GMT 16 Nov 82 HK]

COAL CONSERVATION--Beijing, 18 Oct (XINHUA)--According to the departments concerned, China conserved 64.82 million tons of standard coal from the beginning of 1980 to the end of June 1982, as a result of reduced energy consumption. The total amount of coal saved is equal to the annual output of three Kailuan coal mines. The reduced energy consumption resulted from limiting the production of high energy-consuming heavy industry and vigorously developing the production of light industry accounts for about 2/3 the total amount of the coal conserved and the remaining 1/3 was achieved through improvement of management and promotion of technical reforms. However, many localities still do not pay much attention to energy conservation, and energy waste and consumption are still very high in China. In this connection, there is still great potential for saving energy. [Text] [Beijing XINHUA Domestic Service in Chinese 0057 GMT 18 Oct 82 OW]

SHANXI COAL QUOTA MET--Encouraged by the spirit of the 12th CPC Congress, by 1 December coal mines throughout the province had fulfilled the task of producing 130 million tons of raw coal set by the state. In addition, local coal mines and coal mines run by communes and production brigades throughout the province have also overfulfilled state production quotas 1 and 2 months respectively ahead of schedule. In other words, they have accomplished yearly production quotas of 60 million and 30 million tons of raw coal respectively. [Text] [HK151026 Taiyuan Shanxi Provincial Service in Mandarin 2300 GMT 11 Dec 82]

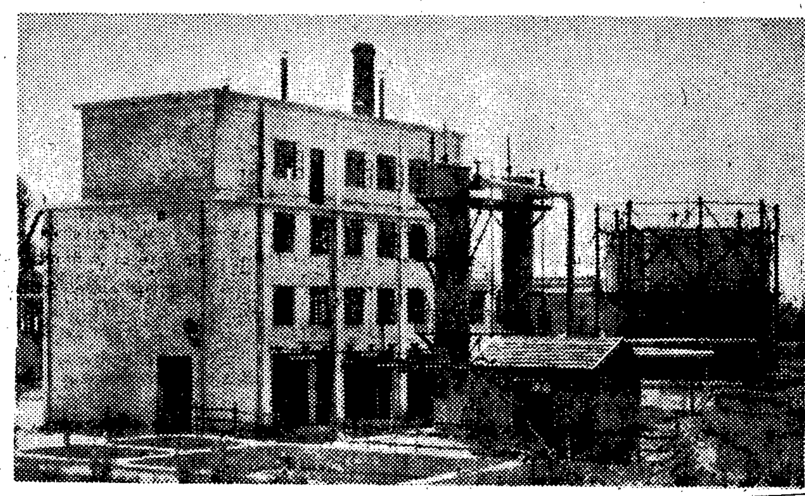
CSO: 4013/88

OIL AND GAS

NEW COAL GAS FACILITY IN JINCHENG COMPLETED

Taiyuan SHANXI RIBAO in Chinese 22 Nov 82 p 2

[Photograph and caption]



In order to conserve energy and reduce environmental pollution, China's major anthracite production base, the Jincheng Mining Bureau, began construction of a coal gas facility in August 1981. Successfully tested in January 1982, it now produces 12,000 cubic meters of gas a day for some 3000 consumers.

CSO: 4013/82

NEW TECHNIQUES SQUEEZE MORE OIL, GAS FROM OLD WELLS AND FIELDS

Chengdu SICHUAN RIBAO in Chinese 3 Sep 82 p 3

[Article by Li Guo [2621 2047] and Wang Jiyuan [3076 4949 0337]: "Old Gas Fields and Wells Producing More Each Month"]

[Text] Staff and workers of the southern Sichuan oil and gas fields development command of the Sichuan Petroleum Bureau have taken effective measures, including scientific management, to develop the production potential of old gas fields and wells, improved the recovery rate of national gas and increased its production. The production of natural gas in this mining region steadily increased every month in 1982.

The gas fields in the southern Sichuan mining region have reached the middle and final phases of development and the ratio of reserve and recovery is badly out of porportion. There are certain difficulties in accomplishing the 1982 production goal. In view of the lack of back-up resources in the gas fields and the limited number of new wells going into production, the party secretary of the command decided to take various technical measures to strengthen the scientific management of old gas fields and wells and to develop the production potential of natural gas. Engineering and technical staff, led by cadres of the development command, went into the field to investigate and analyze the natural gas reserve, ground water, gas pressure and well opening profile item by item for each old gas field and gas well. They devised production plans for each gas well and took sound technical measures for a steady and increasing production. Scientific management was applied to 80 old gas wells in the area and operations were conducted strictly according to the coordinated production plan to maintain stable pressure and stable production. In early March 1982 the pressure of gas well No Lu-3, a workhorse well, began to fall and gas production tapered off. Leaders and technical staff of the command and the gas mining team made a detailed investigation and confirmed that the pressure drop was caused by problems of the gas delivery line. Timely measures were then taken and the well pressure gradually returned to normal. As development efforts went on, more than 95 percent of the major old gas wells in the area achieved stable pressure and stable production in the first 6 months of 1982.

At the same time, effective technical measures were taken to improve the production of 52 low-pressure, low-yield wells by using chemical foam drainage and small oil pipe drainage, by installing pressure boosting nozzles and pressurization stations and by salt water recycling. In the first half of 1982, the development command employed chemical foam water drainage in 15 low pressure gas wells and obtained pronounced results in 11 of them and increased the natural gas production by 2.85 million cubic meters.

9698
CSO: 4013/167

OIL AND GAS

OFFSHORE OIL OPERATIONS TO REQUIRE MORE SUPPORT VESSELS, HELICOPTERS

OW220855 Beijing XINHUA in English 1526 GMT 21 Dec 82

[Text], Guangzhou, 21 Dec (XINHUA)--China will need at least several hundred million U.S. dollars to service petroleum exploitation now underway in the South China Sea, a senior business official in Guangzhou said today.

Between 30 and 40 ships will be needed to service 15 drilling platforms expected to begin operation in the South China Sea in the next couple of years, said Chen Lizhong, manager of the Joint General Petroleum Service Corporation of the South China Sea. It will cost 100 million to 200 million U.S. dollars to build the fleet.

The corporation has signed a contract with Singapore's Sin-Hai Offshore Co. Ltd. for a joint venture--the Zhong-Chang Offshore Marine Service Co. Ltd.--as part of the effort to provide the shipping service. It has also contacted or had talks with other firms in Singapore, Norway, the United States, Denmark, West Germany and Hong Kong, Chen Lizhong said.

Initial evaluation has been completed on the more than 100 bid proposals put forward in August by 33 foreign oil companies in nine countries and regions for joint oil exploitation in 150,000 square kilometers of the South China Sea. Chinese authorities have asked further interpretation on the bid proposals in order to further evaluate them.

"In view of this," he said, "work has to be intensified to make preparations for the oncoming oil boom."

Foreign experience shows that an offshore drilling platform requires support by an average of 1.2 to 1.5 helicopters, Chen Lizhong said. "This means we need to have 18 to 20 helicopters for 151 platforms, which might cost half a million U.S. dollars."

The General Service Corporation, which was inaugurated in May, operates under the joint ownership of the Guangdong Provincial Government and the Ministry of Petroleum Industry. "While stressing self-reliance," he said, "we seek international cooperation."

The corporation has signed a letter of intent with an American marine engineering company on diving services, Chen Lizhong said. Another agreement with another American company on diving services and training of divers has also been reached.

The corporation received in October a joint group from eight Singapore companies studying the feasibility of operating with China in construction of land bases servicing offshore oil workers. It also welcomes cooperation with Hong Kong, Macao and foreign companies in providing telecommunications services and food and other essentials, the manager said.

Eight companies have been established by the service company and local authorities for the construction and development of land bases or specializing in helicopter, salvaging and other services.

CSO: 4010/30

OIL AND GAS

OIL, GAS SURVEY TASKS OUTLINED

OW241000 Beijing XINHUA in English 0719 GMT 22 Dec 82

[Text] Beijing, 22 Dec (XINHUA)--A petroleum geology conference under way here has outlined five areas for extensive survey and exploration during the next 10 years, and projected a sharp increase in the verified natural gas reserves in the next decade.

The extensive search for oil and gas, stretching from Xinjiang's 560,000-square-kilometer Tarim Basin to the East China Sea and from northeast China to the Chang Jiang Basin, is expected to have a significant impact on the structure and distribution of the nation's energy resources in the last ten years of this century, a spokesman for the Ministry of Geology and Minerals said.

The five areas identified for concentrated survey are the sedimentary basins in central and east China, including the western Sichuan Basin, the Ordos Highlands in Inner-Mongolia and regions south of the Songhua and Liache rivers in northeast China; offshore areas in the East China Sea and the South China Sea; northwest China region with emphasis on the Tarim Basin; areas with complex geological structures in east China's Mesozoic and Cenozoic Basins; and the carbonatite zones in the upper and lower reaches of the Yangtze River.

The ministry said that survey of the 260,000 square kilometers of continental shelf of the East China Sea, the Tarim Basin and several other places will be completed within five years.

The emphasis of the survey is to find new oil-bearing structures and coal gas.

In the next ten years, the ministry spokesman predicted, China's offshore areas will become important oil and gas production centers and natural gas reserves will increase sharply. There are good prospects of finding rich oil and gas reserves in the tarim Basin which will create favorable conditions for developing industry and agriculture in the regome regions, he said.

CSO: 4010/30

OIL AND GAS

BRIEFS

PINGHU OIL EXPLORATION WELL--Shanghai, 30 Nov (XINHUA)--The Marine Geological Survey Bureau has reported that it began sinking a new oil exploration well, Pinghu No 1, on 17 November in the East China Sea. The new well, located 420 kilometers southeast of Shanghai, is now more than 500 meters deep. The well, the second sunk in the East China Sea by the bureau under the Ministry of Geology and Minerals, is 100 kilometers southwest of the natural gas producing Longjing No 2 well, which was completed in August. The basin with an area of 460,000 square kilometers is the largest of the 6 oil-and-gas bearing basins found on China's continental shelf. The area has great potential because of the sediment deposited by the flows of the Yangtze, Qiantang, Oujiang and Minjiang River systems, the bureau said. [Text] [Beijing XINHUA in English 0748 GMT 30 Nov 82]

CSO: 4010/30

EXPERIMENTAL METHANE GENERATOR MAY HELP EASE RURAL ENERGY SHORTAGE

Beijing GUANGMING RIBAO in Chinese 29 Oct 82 p 3

[Article by Fu Xin [4395 9515] and Huan Fa [3562 3127]]

[Text] It was harvest season. The fields south of the Chang Jiang were a golden color. We started from Changzhou City and traveled to the Jiangsu Methane Research Institute by car.

The Institute is approximately 14 km from the city, near the town of Benniu in Wujin County. Its predecessor was the Wujin County Methane Experimental Station; in 1976, it only had five employees. Three years later the Institute was established, and now it has a staff of 42. Compared with other research institutes in many large cities, this institute is not a very impressive one, but it has the important responsibility of leading the effort of methane development for the entire province or even the entire country.

According to the director, Zhu Hanwen, the institute has three main research branches: the synthesis branch, whose function is to study the synthetic use of methane; the pool construction branch, whose function is to study the structure of methane pools; and the fermentation branch, whose function is to study techniques of fermentation. The study of construction materials for the methane pool is the responsibility of a special task force. We saw a new material which was under development--the red clay plastic. Red clay is the residual raw material from aluminum plants. Compared with cement tiles, red clay plastic is lighter in weight, less expensive, and has better sealing and aging-resistent properties; its useful life is at least 10 years or more. Soft plastics of this type have already developed; hard plastics are currently under development. If all the original methane pools had been built with red clay plastic instead of cement tile, it would have had a tremendous economic impact on the development of the rural methane industry.

We briefly toured their experimental methane power generation station.

Walking out of the main building of the Institute, we saw a cylindrical structure standing on the ground--a 50-cubic-meter vertical methane fermentation pool; it was 6.12 m in diameter and 5 m in height. It was heated by a solar water heater. There were two other 50-cubic-meter constant-temperature methane pools placed under ground; only their feed mouths and vent tubes were visible above the surface. The raw materials for the fermentation pools are provided

by the manure from 100 head of pigs. The manure enters the fermentation pools through the feed mouths; and the methane gas produced by the fermentation process flows through the vent tubes into a purifier, where carbon dioxide and hydrogen sulfide are removed, and then into a 20-cubic-meter storage tank.

In the power generator room, the operator pushes a button on the control panel, and methane gas begins to flow from the storage tank into the methane engine, where it is detonated. The combustion of methane gas in the engine cylinder pushes the piston which in turn drives the generator. The indicator lights on the control panel show the voltage fluctuating between 380 and 400 volts, and the frequency at approximately 50 cycles per second. At full load, the generator bank produces 8 kilowatts of electricity with frequency fluctuations of less than 8 percent and engine speed variations of less than 6 percent. The generator bank has been operating normally for 1,230 hours.

The marsh gas, we were told, contains 60 to 62 percent of methane and each cubic meter produces 5,200 kcal of heat, which is equivalent to 1.55 kwh of electricity. The thermal efficiency of the generator bank is higher than 29 percent.

"Why experiment with marsh gas for power generation?" we asked. The answer from the director of the Institute was right to the point. "There is a shortage of electricity on farms and livestock installations; in remote regions the shortage is even more severe. Because of the many advantages of electric power, a number of communities are already using diesel engines to generate electricity. As a initial effort to develop methane gas power generation for the farming communities of this country, the popular farm-use diesel engine S196 was converted into a single fuel methane gas engine, and an 8-kw methane gas experimental power station was constructed. "Then the key to the success of this effort must have been the conversion of the diesel engine to a methane gas engine."

"Yes. In the conversion process every effort was made to keep the changes to a minimum, to use common parts, to reduce cost as much as possible, and to ensure reliable operation. In short, a great deal of consideration was given to this effort from the user's point of view. In particular, significant efforts were devoted to redesigning the ignition systems, the speed regulating mechanism, the compression ratio in the cylinder, and the gas supply system. The result was quite satisfactory."

According to our observation, the Jiangsu Methane Research Institute is indeed making a concerted effort to solve the farm villages! energy problems. At present there is a severe shortage of energy supply in China's farm villages. In Jiangsu Province for example, the farmers need 55 billion jin of firewood each year; however, according to 1979 statistics, the actual firewood available as fuel was only 30 billion jin. Therefore, each year a shortage exists during 3 to 4 months or even 6 months; in other words, while there is no worry about food supply, there is a problem with cooking fuel. By developing the methane industry, it is possible not only to save considerable firewood and return the needed organic substances to the fields, but also

to provide an energy source and change the unsanitary habits of the past. It will have an important impact on the energy development, fertilizer supply and environmental sanitation of China's farm villages. The comrades at the Methane Research Institute are fully aware of their important mission and are highly motivated to carry out their work.

3012
CSO: 4013/61

BETTER EQUIPMENT RESTORES CONFIDENCE IN METHANE STORAGE OPERATIONS

Fuzhou FUJIAN RIBAO in Chinese 3 Sep 82 p 2

[Article by Lin Zhaosen [2651 5128 2773]]

[Text] In the past several years, marsh gas construction has progressed steadily in Fujian Province and the new situation of masses of areas of fuel shortage competing with one another for building methane tanks has appeared.

In Fujian there have been two waves for marsh gas among the masses, one in 1958 and another in the mid-70's, and a large number of methane tanks were constructed then. Affected by the error of leftism, however, there was a one-sided pursuit of quantity. The quality of the tanks was ignored. The benefit of the tanks was poor they got a bad name. Following the Third Party Congress, the various areas of the province proceeded to absorb the lesson of the past. In the tank construction process, the first task is to train, examine, and choose a staff skillful in marsh gas technology. Marsh gas tanks may then be built strictly in accordance with the National "Collection of Standardized Marsh Gas Designs for Domestic Use in Rural Villages," so that a design using locally convenient materials may be selected to cause the newly built tanks to produce gas satsifactorily and be welcomed by the masses. Since then, in most of the coastal regions where fuel is seriously deficient and in those mountainous regions where trees are few and erosion is severe, special teams have been organized and systems of construction and management responsibilities have been perfected. Various forms of building contracts have been adopted to guarantee construction quality. Last year, more than 95 percent of the tanks built in the province were successful during the first pressure test. During the first 6 months of this year, a total of 1,500 tanks were built in the province and the rate of success exceeded 98 percent.

In order to raise the economic benefit of marsh gas, a methane tank survey project has been underway in many prefectures and counties. A file system has been established consisting of documentation cards on the tanks in order to summarize the experiences of repairing faulty tanks. A group of well-managed and well-utilized advanced methane tank model have emerged. For example, the 207 households of the Longxi Brigade, Tongan County, of Xiamen City built 196 tanks which can, basically cook 3 meals daily and provide

for 2 lamps at night. For each household, 10,000 jin of firewood [stalks] and 60 jin of lamp kerosene are saved every year. In a year, the brigade may clear 60-70,000 dan of marsh gas liquid fertilizer and more than 200 dan of marsh gas sludge.

As the quality of tank construction is guaranteed, the management has begun to show benefits to restore the reputation of marsh gas. At present, the farming households of areas of fuel shortages are competing with one another to construct tanks. During the first 6 months this year, 120 tanks were built in Huian County. There remain more than 500 households that have requested tank construction. In a number of areas, the situation has changed from leaders wanting the masses to build gas tanks to masses wanting the tanks themselves, from villages building tanks to agencies, schools, livestock farms, townships, and military units building tanks, from tanks built by individual households to collective construction of groups of them.

6248
CSO: 4013/34

SUPPLEMENTAL SOURCES

PROSPECTS FOR THE DEVELOPMENT OF SOLAR HOUSES IN CHINA EXPLORED

Beijing TAIYANGNENG [SOLAR ENERGY] in Chinese Vol 3, No 4, 25 Oct 82 pp 388-393

[Article by Li Yingcai [2621 5391 2088], Li Sulan [2621 5685 5695], and Wang Yusheng [3769 3768 3932]]

[Text] This article describes the current status of solar house development in China and discusses the future prospects of solar houses in this country. It is pointed out that the use of passive solar houses in single-story and multi-story residential buildings is economically feasible and technically reliable, and that the prospects for future development are very encouraging. In addition, this article also offers several practical suggestions for future work in this area.

In certain industrialized nations, the energy requirement for heating and air conditioning accounts for a large fraction of the total energy consumption; therefore, a great deal of attention has been devoted to the use of solar energy for heating and air conditioning. In some countries, so much interest has been generated in solar houses that the number of such houses constructed in the world is currently estimated to be in the tens of thousands. The passive solar house is structurally simple, economical, and notably energy efficient; in terms of technology and economy for heating purposes, it is now competitive with conventional fuels.

Therefore, it is of practical significance to develop and build solar houses which are compatible with China's rural villages and cities.

I. Current Status of the Construction and Research of Solar Houses in China

According to incomplete statistics, currently 16 solar houses have been constructed in this country.

In 1977, the first passive solar house in this country was built at the Chongxin Commune of Minqin County; which is located east of the Gansu-Hexi corridor, near the Tengger Desert. It was developed by the solar energy research group of the commune, which used mud bricks to build walls and wheat stalk, hay and mud to build the roof. The house was used to conduct

experimental research on various types of heat retaining walls. Located at 38.27 north latitude and 102.83 E longitude 1400 m. above sea level, the Minqin solar house receives a large amount of solar radiation--totaling 3000 hours of sunshine per year. While the outdoor temperature in the winter is quite low (average temperature in January is -10° C, and the average temperature difference between night and day can reach 14.7° C), the rate of solar heat supply can still reach 80 percent when the room temperature is maintained above 16° C. The cost of construction of the solar house was only 10 to 12 yuan per square meter more than that of a conventional residence in that area. Their research work demonstrated the feasibility of using passive techniques to solve the heating problem.

In September 1978, the Gansu Province Natural Energy Institute built an active solar energy experimental house at the same location to conduct studies of solar energy hot water heating system. When the room temperature is above 15° C, the rate of heat supply from solar energy is 67.2 percent. The cost of solar energy hot water heating system is 133 yuan per square meter of building area.

In the winter of 1979, the Yangcun passive solar house, designed by the civil engineering department and the architectural department of Tianjin University was constructed in the courtyard of the guest house of Wuqing County government in Tianjin. It was one of the earlier practical passive solar houses developed in this country. The construction of this house was based on only conventional techniques; no special materials or complicated building procedures were used. Appropriate measures were taken to provide heat insulation in the roof and outer walls; heat collection techniques based on direct gain devices and heat storage walls were used on the south-facing part of the house. The construction was also compatible with architectural and esthetic considerations. The cost increase per square meter of area was only 14.26 yuan. During an entire heating season, the energy saving can be 77.3 percent when the room temperature is maintained above 10° C. The Yangcun solar house demonstrated that in a region with conditions similar to those in Tianjin it is entirely feasible to find a low cost solution to the heating problem for low-standard residential houses.

In the winter of 1980, the passive solar-heated building of the Gangcha County Quanji Post and Telegraph Office designed by the Qinghai Architectural Design Institute and the Qinghai Post and Telegraph Institute went into operation. The surrounding walls of the heat collection room are made of 1½ bricks stuffed with 120mm wood ships. The entire south side consists of heat-retaining walls made of one layer of glass and one layer of polyester film and glass windows. In order to increase the heat-collection area, the wall is extended 1.2 meters below ground and .9m in the east-west direction. The two ends of the building are non-heat collecting rooms. The cost of construction of the solar house is 40.9 yuan more per square meter than conventional buildings in that area. When the outside temperature is -10° C to -10° C, the room temperature can be maintained above 10° C. The Quanji solar house is located on the Qinghai-Xizhang highland 3,301 m above sea level, where solar radiation is intense. The January mean temperature

is -14.2° C, and there is a severe shortage of fuel supply in the area. The completion of the Quanji solar house represents a significant step forward in utilizing solar energy for remote regions which are rich in solar energy.

In 1980, the Shijiazhuang Housing Bureau and the Hebei Energy Institute installed passive heating and appropriate heat insulation measures in one of the middle units of a five-story apartment building; passive heating consisted of using heat-collecting walls and direct gain windows. By spending only 9.41 yuan per square meter in additional construction cost, satisfactory heating results were achieved. For a three-room apartment unit with a stove in the kitchen, the room temperature in the entire unit can be maintained above 10° C. This was the first attempt of applying passive solar energy techniques in an urban multi-story residential building in this country.

In 1982, Tianjin University, Qinghua University, and the Beijing Solar Energy Institute constructed three solar houses in Yihezhuang of Daxin County and achieved encouraging results. This work is still continuing.

A significant amount of work has also been done in theoretical research of solar houses and in material research. Since 1979, the Heat Energy Department and the Architectural Department of Qinhua University had been conducting model experiments with passive solar houses as well as active solar energy hot water systems. A mathematical model had been developed to simulate the heat exchange process in a solar house and to study optimum design parameters and optimum operating conditions. The Hebei Energy Institute had developed water-soluble heat-absorbing coating material. The Tianjin synthetic material factory developed polyester transparent fiberglass.

In short, over the past few years, research work in solar houses have been progressing at a rapid pace, and solar houses have been built around the country. In addition to the frigid northeast region (currently there is only one active solar energy laboratory located in Liaoning Province), passive solar houses have been built in such locations as Urumqi of Xinjiang Province; Lanzhou, Wuwei of Gansu Province; Hohhot, Ximengheichengzu of Nei Monggol; Quanji, Xining of Qinghai Province, as well as Tianjin and Beijing. While there is considerable room for improvement in the design, materials, and construction techniques of these solar houses, these efforts clearly demonstrated the possibility of developing passive solar heating for most regions in this country which require centralized heating.

II. Current Energy Consumption for Civilian Heating and Conventional Heating Methods in China

1. Energy Consumption for Civilian Heating

The total energy consumption of a country and the distribution of its energy sources reflects the production and living standards of that country.

For example, in the United States, civilian energy consumption amounts to 33.6 percent of the total energy consumption; 53 percent of the civilian energy consumption is attributed to heating (18 percent of total energy consumption), and 8 percent is attributed to air conditioning.

On the basis of currently available data, it is difficult to estimate the energy consumption for heating in this country as a percentage of total energy consumption. For purpose of illustration, a rough analysis of energy consumption for heating in the city of Tianjin has been carried out. During 1980, the total energy consumption in the city of Tianjin was 12,140,000 tons of standard coal, of which 728,600 tons were used for heating, or 6 percent of the total consumption. The heating energy consumption was divided equally among public use and residential use. Currently, most residents use stoves in the winter for both heating and cooking.

Stimulated by the Four Modernizations program, production has expanded rapidly; large numbers of urban residential buildings have been constructed. As a consequence, civilian energy consumption in the cities is expected to grow dramatically.

The farmers of this country, which account for 80 percent of the total population, have traditionally used firewood as the main energy source, and have maintained a very low standard of energy consumption. But in recent years, due to the synthetic use of firewood and hay and the large amount of residential construction, energy consumption by farmers will also grow substantially.

Under this new scenario, it is difficult to satisfy the energy needs by relying on conventional energy sources alone. Therefore, the implementation of energy conservation measures and the use of solar energy for heating, hot water, and air conditioning have practical significance.

2. Conventional Heating Methods

Currently, China's cities commonly use regional centralized hot water heating and stove heating: The small coal-fired furnaces used in these heating systems have low thermal efficiencies and will inevitably have a negative impact on the environment if allowed to develop on a large scale. Based on current architectural and construction engineering specifications, we have calculated the approximate cost of regional centralized heating for several urban locations (including furnace, furnace room, as well as indoor and outdoor piping and equipment), as shown in Table 1.

Table 1

Location	Tianjin	Shenyang	Hohhot
(yuan/m^2)	14.82	20.85	24.75

As an example, consider a 10^7 kcal/hr hot-water furnace in Tianjin used to provide regional centralized heating for a 10^5 square meter apartment

complex. Assume that the heating season is 120 days, the daily heating period is 8 hours, the heat capacity of coal is 4000 kcal per kg, the cost of coal is 30 yuan per ton, and the furnace efficiency is 70 percent, then the annual coal assumption for the system is calculated to be 3,429 tons, the annual coal consumption per square meter of building space is 34.29 kg and the cost is 1.03 yuan per year per square meter. Suppose that the population of Tianjin is 4 million. Currently, the average living space per person is 3.5 square meters; suppose that with improved living conditions the average living space per person is increased to 5 square meters, than 6 million square meters of new residential area must be constructed. Using the above calculations, this additional space translates into an increase of 206,000 tons of coal consumption for heating, which is equivalent to 118,000 tons of standard coal.

At present, a large portion of China's population still uses stoves for heating. The thermal efficiency of small stoves is even lower, resulting in considerable waste of fuel. Furthermore, the smoke produced by the stove is exhausted into the lower atmosphere, and the large amount of residues from the stove have become the main source of urban trash in the winter; they are major contributors to environmental pollution.

III. Encouraging Prospects for Developing Passive Solar Houses in China

The regions for centralized heating in this country are located largely north of the Longhai railroad. These happen to be regions with abundant supply of solar energy resources (except Heilongjiang); most of these regions have moderate outdoor temperatures. In the northwest region and the northern part of New Monggol, the temperatures are quite low, but there is ample supply of solar energy, and the diurnal temperature variation is large. On a clear winter day, the noon time temperature can be sufficiently high to allow efficient utilization of solar energy. Therefore, most of the regions which require centralized heating have favorable conditions for utilizing solar energy. The key issues in the development of solar houses are the amount of initial investment and the operating reliability. Active solar heating and air conditioning systems provide better performance in terms of meeting room temperature requirements, but the initial investment is so large that with current technologies it would be difficult to recover the equipment cost from energy savings. Therefore, under China's current economic conditions it is impractical to develop active solar energy heating and air conditioning systems. It is known from experience that passive solar houses require little investment and produce impressive results in energy conservation. The prospects for their future development in this country are excellent. However, it is important that the solar houses to be developed should be compatible with China's economic conditions and the customs of the people. The designs of solar houses should not be copies of existing designs but should reflect China's unique style.

To meet these objectives, we offer the following viewpoints:

1. The investment in solar houses should be based on the climate condition of the region, the room temperature requirement, and the rate of heat supply

from solar energy. The design should be based on current heating standards and economic conditions; the goal should be to maintain current room temperature standards rather than seeking excessive heat supply from solar energy. On the basis of the types of solar houses considered in this article, good results can be achieved without increasing the construction cost significantly. If the room temperature is maintained at 10° to 15° C during the heating season, the rate of heat supply from solar energy can reach 80 percent. Passive solar homes are definitely more economical than regional centralized heating systems if the additional construction costs are compared with initial investment costs and coal consumption. With the exception of a few cold days, passive solar houses can generally maintain the same room temperatures as conventional heating systems. For residential houses, the auxiliary heat supply can be generated from other daily heat sources, with very little impact on cost.

2. For urban residential buildings, passive solar heating has proved to be economically feasible and technologically reliable. The passive solar houses of western countries are mostly single-family homes whose exterior walls are made of light structures with very poor heat-retaining properties. To store heat it is necessary to use additional water tanks, pebbles, or phase change materials. Furthermore, the room temperature requirement is generally quite high (20° C) with little temperature fluctuations. Under these circumstances, to achieve a certain rate of heat supply would necessarily be very expensive and require heavy consumption of conventional energy sources.

Most of the urban residences in this country are multi-story apartment buildings which are constructed from brick structures with good heat-retaining properties. Multi-story buildings suffer smaller heat loss than single-story residences or single-family homes; the constuction cost per square unit area is also lower. In an apartment building, it is possible to ensure a definite ratio between the surface area for collecting solar energy and the heating area, and to achieve a certain rate of heat supply from solar energy. Also, the temperature requirement in this country is lower than that of other countries, and other heat usages (e.g., boiling water, cooking with a coal or gas stove) can provide auxiliary heat sources.

Therefore, by taking appropriate measures to enhance the insulation and heat-retaining ability of building structures, and by carefully arranging the structures to fully utilize solar energy, it is possible to design Chinese-style passive solar houses which are economical, practical, and esthetically appealing. The construction cost will be lower than that of existing single-story passive solar houses, whereas the performance will be better. This result has been demonstrated by the solar-heated multi-story apartment building constructed by the Shijiazhuang Housing Bureau.

3. The traditional farm house in China has a long history of utilizing solar energy for heating. For example, the farm houses in northern China are mostly situated in a south-north direction; the south-facing side usually has a large glass window. The exterior structures of the houses have good heat-retaining properties (the walls are commonly made of mud

bricks, and the roofs are made of wheat stalks, mud, and hay), inside the houses there are fire pits which provide auxiliary heat sources for boiling water and cooking, and there are spacious court yards in front of the houses. These are all practical applications of passive techniques in house construction. Therefore, in future development of passive solar houses in rural areas, one should take advantage of the experiences from traditional construction techniques, and ensure compatibility with the customs of farming villages. By taking a systematic approach in rural construction planning, adopting logical unit designs, and selecting appropriate construction materials, it is possible to utilize solar energy more effectively and further increase the rate of heat supply.

4. To apply passive solar heating to large public buildings is more difficult because this type of structure has a limited amount of south-facing surfaces to capture solar energy, whereas the amount of space to be heated is quite large. Hence, it is difficult to achieve a high rate of heat supply from solar energy. In a large public building, auxiliary heat sources must be used to heat north-facing rooms and to supplement the heating of sourth-facing rooms. Since the auxiliary heat sources in this country are primarily centralized heating systems, the economical feasibility of passive solar heating in such application is greatly reduced. To conserve energy, the practical approach would be to enhance heat insulation measures in building construction, and to utilize solar energy wherever conditions permit.

IV. Suggestions for Future Development of Passive Solar Houses

In order to accelerate the development of solar houses in this country, we offer the following suggestions:

1. The national energy policy should clearly specify that in future construction, considerations must be given to energy conservation and to the utilization of solar energy in order to conserve conventional energy resources and to protect the environment.

2. The merits of construction planning and individual building design should be evaluated using energy conservation and solar energy utilization as important technical and economical indices. Superior designs should be selected to construct model energy-saving houses complexes in the cities and model energy-efficient farm villages in rural areas.

3. Systematic theoretical and experimental research should be conducted to study the thermodynamic properties of passive solar houses which are compatible with the structural design traditions and heating practices in this country. As soon as possible, design procedures, design parameters, and various technical and economical indices should be established for designing passive solar houses, and design handbooks for passive solar heating should be prepared.

4. Materials and components required for constructing passive solar houses should be developed and produced in order to reduce construction cost.

3012
CSO: 4013/43

SUPPLEMENTAL SOURCES

DONGWANZHUANG, HEBEI, IS MODEL OF SOLAR, METHANE UTILIZATION

OW300722 Beijing XINHUA in English 0711 GMT 30 Dec 82

[Text] Beijing, 30 Dec (XINHUA)--A small village on the north China plain, which uses solar heat and biogas for heating water, cooking and electricity generation, has become an example for tapping new sources of energy.

A meeting was held recently in Dongwangzhuang Village in Zhaoxian County, Hebei Province, to enable people from other parts of Hebei to learn from its example. The meeting was attended by acting governor of the province Liu Bingyan and top officials at the prefectural and county levels from different parts of the province.

The peasants in the village are delighted at the benefits brought to them by the new sources of energy:

Two small biogas power stations built by the Dongwangzhuang Production Brigade there provide electricity for peasant households and for spare-time classes and public recreational activities in the evening;

Hygiene conditions have improved since manure is treated in sealed fermentation pits; and

Solar heated public bathhhouses built by the brigade provide baths for the peasants and cooking time is shortened.

China, with the largest agricultural population in the world, is developing agriculture so that it will be efficient, giving high yields, but not requiring tremendous quantities of petroleum or coal.

About seven million biogas pits have been built in rural China. In Hebei Province, 324 villages now use biogas as a major source of fuel and more than 1,000 villages have begun using biogas and solar heat alternately.

Now 120 of the 130 peasant families in Dongwangzhuang Village have built fermentation pits or digesters for producing biogas, and 80 families have installed locally made solar-heated cooking stoves. Since biogas is available only six months a year in the warmer seasons, most of the families use solar heat as a supplement to marsh gas.

In Dongwangzhuang Brigade, the use of biogas and solar heat conserves 200 tons of coal a year. Four hundred and fifty tons of stalks, traditionally burned as fuel each year, are now turned into compost or high-quality organic fertilizer through fermentation. Expenditures on coal, fertilizer and electricity is reduced by 21,000 yuan (about 10,500 U.S. dollars) a year.

CSO: 4010/28

SUPPLEMENTAL SOURCES

BEIJING SUBURBS USE MORE SOLAR ENERGY, METHANE

OW250902 Beijing XINHUA in English 0701 GMT 25 Nov 82

[Text] Beijing, 25 Nov (XINHUA)--Instead of extensively developing electricity as an energy source some sururban Beijing villages are skipping a step and moving directly to the use of solar energy and marsh gas.

Of the 162 families in Liumingyin Village, Daxing County, for example, 154 families have installed solar water heaters. As a result, they no longer bathe in the river or go to public bath houses. One hundred fifty-six families are now using marsh gas--also known as methane--for cooking. Now large quantities of logs, stalks and coal are saved and daily life has become cleaner and more convenient.

According to figures of the municipal government 32,000 marsh gas tanks have been installed in Beijing surburbs for cooking and lighting.

Generally speaking, a marsh gas tank of 8 cubic meters can enable a family of 5 to cook three meals a day for six months, two meals a day for two months and one meal for four months. This is the case because when the weather becomes too cold, the process of fermentation is slowed, and gas cannot be produced quick enough. The gas produced by a tank of this size can also power a 40 watt light bulb in addition to cooking.

Solar water heaters are a new development in the past year or so, between April and October every square meter of light absorption can heat up 100 kilograms of water to 40 to 60 degrees centigarde, enough for showers for 3 to 5 people. At the initial stage, such heaters were installed and used by production brigades collectively. But now they are being used in the families and efforts are being made to improve the installation to make them function in all weather, including the coldest of winter.

Beijing suburbs are also experimenting on geothermal energy. Bath houses using earth heat have been set up in Daxing County as well.

CSO: 4010/28

BRIEFS

XIZANG SOLAR ENERGY--Lhasa, 23 Nov (XINHUA)--The Tibet Solar Energy Research Institute, with 5 million yuan allotted this year by the autonomous regional government, has developed a solar energy water boiler and an oven, according to the institute. The institute, established in 1981, is part of an effort to exploit the more than 3,000 hours of yearly sunshine on the Tibet Plateau, the "Roof of the World." Together with the Tibet Society of Solar Energy, they have installed boilers in 32 government departments, schools and enterprises in Lhasa. Public bathhouses using solar energy for water heating have also been built in Lhasa, the regional capital. Institute scientists are developing a number of new items including solar-heated barns. [Text] [Beijing XINHUA in English 1149 GMT 23 Nov 82 OW]

CSO: 4010/28

CONSERVATION

AGGRESSIVE ENERGY CONSERVATION PROGRAM ADVOCATED

Beijing GUANGMING RIBAO in Chinese 12 Nov 82 p 3

[Article by Hu Youquan [5170 2589 3123]]

[Text] Premier Zhao Ziyang [6329 1350 3603] recently pointed out that as a goal to achieve continuous economic growth, China should strive to double its agricultural and industrial production by the year 2000. The problem is the severe shortage of capital, energy resources, and materials. Therefore, it is essential that the scientific and technical community develop new technologies in energy development, and energy conservation, and make them available to various industries and businesses. For this reason, this reporter visited China's energy expert, Professor Zhao Ziyang, to discuss problems of energy conservation.

[Question] The importance of the energy resources has been discussed a great deal in recent years, what are your views on the issue?

[Answer] Energy resources are the foundation of socialist modernization; they provide the assurance for continuous economic growth and the basic conditions for improving people's standard of living. Comrade Hu Yaobang pointed out in his report to the 12th Party Congress:

"In the next 20 years, we must devote our attention to the basic issues of agriculture, energy, transportation, education, and science, and recognize them as the key issues in economic development." "The current shortages in energy resources and transportation is a major factor limiting China's economic growth." These statements clearly illustrate the importance of the energy problem.

[Question] Why are you particularly concerned about energy conservation?

[Answer] Because energy conservation is the most effective, least expensive, and most timely approach in providing relief to the "energy crisis." It is also an effective long-term strategy to deal with the energy problem. In fact, not only this country, but most countries in the world consider energy conservation as a problem of immediate urgency. If every nation can reduce its energy consumption by 5 percent, the amount of energy saved should be 72 percent greater than the total energy supply from hydroelectric and nuclear power. If China can reduce its energy consumption by 5 percent the energy savings would be 56 percent greater than the total energy supply from natural gas, or 43 percent greater than the energy supply from hydroelectric power.

With an effective energy conservation program, the limited energy resources can be fully utilized, and thermal efficiency and production can be significantly improved. Therefore, we advocate an aggressive energy conservation program in conjunction with efforts to develop and exploit current energy resources. It is quite appropriate to refer to energy conservation as the "fifth energy source" in addition to the four major energy sources: coal, petroleum (natural gas), hydroelectric power, and nuclear energy.

[Question] What, then, is the potential of energy conservation?

[Answer] There is potential for improving energy efficiency and conserving energy resources in every aspect of energy consumption. The potential energy savings may be realized through improved technology before the depletion of petroleum and natural gas resources. According to a study conducted by the energy conservation committee of the World Energy Conference, the energy utilization efficiency of industrialized nations is only 40 to 50 percent; in this country it is only 30 percent. These figures clearly point out the low thermal efficiency at the present time and the great potential for energy conservation. The potential for energy conservation is also evident from the energy consumption growth coefficient (or consumption elasticity coefficient) of certain countries. The consumption elasticity coefficient is the ratio beween the annual rate of growth of energy consumption and the annual rate of growth of gross national product. Generally this ratio is less than one for industrialized nations and greater than one for developing nations. This is due to the stable economic structure of industrialized nations and their ability to utilize advanced technology to continually lower the energy consumption per unit value of production. The elasticity coefficient provides an indicator of the energy utilization efficiency which promotes the awareness of improving energy efficiency. For certain departments and industries, it may be feasible to set a zero or negative growth rate of energy consumption as a goal.

[Question] What is the real goal of energy conservation?

[Answer] The goal of energy conservation is to use technically and economically feasible, and socially and environmentally compatible methods to utilize energy sources more effectively and to exploit the existing potential within the limitation of natural laws, so that the overall relationship between energy workers actually include every member of the society, who should actively participate in the task of energy conservation.

Energy conservation techniques are now entering a new stage, which emphasizes quality in energy conservation rather than quantity. It is well known that in the process of energy utilization, a certain amount is lost in the energy conversion process; this portion of the energy, which is eventually dissipated in the atmosphere or water, is the unusable "wasted energy". From a quantitative point of view, energy has not been lost, but the quality of energy (i.e., energy level or potential) has reduced from a high level to a low level, and has become unusable or hardly usable. Consequently, in energy conservation it is important to conserve the usable energy level, to exploit the maximum energy potential, so that as much work as possible can be accomplished with a minimum amount of energy expenditure. In other words, efforts should be made to enhance the usability of energy, or to increase the ratio between "working energy" and "non-working energy".

[Question] What should be done to create this new scenario in energy conservation?

[Answer] 1. Efforts should be made to conduct full-scale surveys of industrial energy balance and to perform analyses to determine where the potential of energy conservation exists.

2. On the basis of the results of surveys and analyses, an overall energy model and energy conservation policy should be established to reduce energy expenditure and improve energy efficiency. In addition, a practical plan for increasing the immediate and near-term energy supply should also be established and organizations should be set up to carry out the plan.

3. Efforts should be made to improve energy efficiency, reduce energy expenditure, and to avoid energy wastes as much as possible.

4. Combustion efficiency should be improved; combustion losses and energy conversion losses should be minimized.

5. Heat transfer, heat exchange, and heat transport facilities should be improved to minimize losses during energy transfer processes.

6. Feasible technical schemes should be developed to retrieve and exploit wasted energy at medium and low temperatures.

7. For processes involving large temperature and pressure differences, energy utilization should be divided into several stages. Emphasis should be placed on the quality of energy supply and energy utilization; the energy conversion efficiency for each stage should be maximized.

8. To reduce energy conversion losses, in many cases steam power is used in place of electricity. But to minimize gas exhaust, consideration should be given to convert steam power into electricity.

9. To conserve energy, new technologies, new equipment, new catalysts, new materials,and new energy sources should be used.

10. Efforts should be made to apply the principles of system engineering to exploit and utilize industrial heat energy, electric energy, residual heat, and residual steam and gas to achieve energy balance or to produce net energy output.

11. Continuous effort should be made to renovate fuel structures--replacing solid fuel by liquid fuel, and replacing dirty fuel by clean fuel.

12. New fuel types such as oil shale, pitch coal, hard coal, ash coal, and other low-grade solid fuels should be developed.

In addition, nuclear energy and biological energy should also be developed.

3012
CSO: 4013/61

ZHEJIANG MAPS LONG-RANGE STRATEGY FOR ENERGY CONSERVATION

Hangzhou ZHEJIANG RIBAO in Chinese 18 Aug 82 p 2

[Article by Shen Zhenzhong [3088 2182 0022]: "Establishing a Guiding Ideology for Long-Term Energy Conservation"]

[Text] Based on the actual situation of energy shortages in Zhejiang Province, a guiding ideology centered on long-term energy conservation is proposed. China is rich in energy resources but the development task is falling behind. The energy policy proposed by the Party Central Committee and the State Council is to emphasize both development and conservation, and conservation has the priority in the short term. The situation in Zhejiang Province is different. Zhejiang is short on energy resources such as coal and oil; even though there are relatively abundant hydroelectic resources, their development calls for large investment and long construction time and will not meet the short-term needs. More than 85 percent of the coal required in Zhejiang comes from other provinces. Whether they are allocated by the state or arranged outside the plan, there are major problems such as great hauling distances, complicated loading and unloading procedures and high loss in route. Therefore, the status of the energy problem in the province can be described as a poor resource base, poor transportation conditions and short supply of energy. It is completely consistent with the long-standing party policy of determining work direction based on the actual situation to propose a guiding ideology for long-term energy conservation based on the national energy policy combined with the actual situation in Zhejiang. Because we do not have adequate energy resources, we must work hard on conservation if we are to maintain a certain growth rate of the economy. Compared to other provinces and regions with an abundant energy supply, the conservation goals in Zhejiang should be higher and more efforts should be made. If the actual energy shortage situation were ignored and if nobody were responsible for serious waste and conservation efforts, the results would be production halt or reduction for enterprises and maintaining a certain rate of growth would become an empty verbiage. If one ignores objective reality, one eventually ends up punished by it. There have been many lessons and examples in this regard and we should learn from these experiences and establish a guiding ideology for long-term energy conservation based on conditions in the nation and in the province and thoroughly carry out conservation efforts in actual practice.

Some comrades are doubtful about the potential of conservation, they are negligent about conservation efforts, thinking that they do not have much to gain by conserving, but when they ask their superior for coal and electricity, they are very much up to it. The reality is exactly opposite to what they think, the potential for conservation is great. Strong proof is that Jiaxing is expected to conserve more than 8 percent of its industrial coal in 1982 simply by modifying its industrial and enterprise coke consumption quota promoted by the municipal economic committee. Moreover, 135 of the enterprises in Zhejiang Province each conserve more than 10,000 tons of standard coal, which amounts to 70 percent of the total industrial energy consumption in the province. The provincial government requested the establishment of an "energy balance" system 2 years ago but recent inspections showed that almost 100 enterprises have not yet taken any action. The energy usage in some enterprises is still in a state of "whish-washy" and the consumption of energy resources is like a bottomless pit. If a serious conservation effort is made by these large energy users, great amounts of electricity and coal will be saved. Provincial departments have recently issued warnings to the few "bottomless pits" and took measures to limit or suspend the supply of energy and obtained some results. But a few priority enterprises are still ignoring energy conservation and this is an issue we should direct our attention to.

Can expanded cooperation solve the problem of energy shortage? Some comrades in regions and enterprises with ample supply of cooperation coal think so. Granted it is entirely necessary to ask neighbor provinces and regions for cooperation coal outside the project when there is a resource shortage in the province and when additional allocation of unified-allocation coal is limited. In the last 2 or 3 years, with a concerted effort, Zhejiang Province has actually managed to get more than 2 million tons of cooperation coal beyond the allocation which played a major role in solving the energy problem. In the future we should still take approaches in various levels and along various channels (especially through strengthened technological and economic cooperation) to broaden the source of unbudgeted cooperative coal whenever possible. However, the effort for obtaining cooperation coal and the effort to improve energy management are not mutually exclusive, just like our emphasis on conservation does not preclude the effort to improve production. In the meantime, we should also realize that, since cooperative coal is arranged outside the plan, it is subjected to the limitations of the national plan, transportation conditions and cooperative conditions and is unstable in nature. In the first 6 months of 1982 cooperative coal in Zhejiang suffered a large-scale decrease as compared to the same period in last year, this is due to the factor of instability. We must therefore insist on the guiding ideology of long-term conservation and cannot rely on cooperative coal.

Long-term conservation calls for long-term planning. Beside efforts to manage energy and to reduce the consumption per unit, the principal tasks before us are the adjustment of product structure and the improvement of conservation technology.

Readjustment of product structure must be based on conservation requirements. In 1981 the average energy consumption in Zhejiang is 4 tons of standard coal per 10,000 yuan of gross industrial production. The energy consumption of

certain heavy industry products and the consumption of light industry products differ by several tens of times and some light industrial products for daily use consume almost no energy. Of course, the product structures of various departments of industry are closely related; many light industrial products cannot be produced without the raw material provided by the heavy industries, and the multifaceted dependence of national construction and people's daily life upon the products of light and heavy industries is well known. Readjustment of product structure therefore does not mean that we should stop producing items that require a high energy consumption. At the present time we can only achieve the following things: (1) Some of the high consumption products must be controlled strictly according to national and provincial plans and overproduction, private sales and price hiking will not be allowed. (2) For enterprises among the same profession, the supply of energy should be made selectively on the basis of merit. Enterprises with backward production technology, high energy consumption, poor economic benefit and no improvements after consolidation should be limited or suspended in energy supply and some should even be given a fixed data for closing or switching. (3) Make a major effort to develop energy-saving products that meet the market demand in China and abroad.

Technological improvements centered on energy conservation should be developed. Today, technological performance of some of the major energy consuming facilities in industries and enterprises is poor and energy consumption is high. There are many privately installed boilers and thermal energy is not fully utilized. Major energy consuming technologies such as casting, forging, electroplating and heat treatment are not organized according to specialized cooperation and the energy utilization rate is low. The layout of power grids is irrational and the electric power supply reveals the district phenomenon of "small horse pulling big wagons." These are the targets for today's technological improvement and for the next few years. Conservation and technological improvement have shown some results in recent years and the progress has been slow. One important reason is that some enterprises only pay attention to their own revenue and ignore the conservation benefits to the whole society. Take coal for instance, the price of coal supply in Zhejiang is 60-70 yuan per ton and the cost of coal is generally less than 10 percent of the industrial production cost. The economic benefit of conserving a few tons of coal is not that great. But according to the standard of industrial production in Zhejiang today, 1 ton of standard coal on average can create 2,600 yuan of industrial production if used wisely. Assume 100 yuan of production yields 20 yuan in tax revenue, each ton of standard coal generates 520 yuan in taxes for the state. The social benefit is evident. We should therefore strongly advocate looking at the problem with the overall interest in mind and broaden our viewpoints, straighten our guiding ideology, educate our cadres and staff and workers, and heighten our conservation awareness. In the meantime, the associated departments should also take into account the nature of conservation measures, namely, they generally benefit the society greatly but provide little gain for the individual enterprise, and give the enterprises proper consideration in investment arrangement and material supply. Proper economic reward may also be considered for units doing well in conservation to promote technological improvements in conservation and to derive benefits from such improvements at an earlier date.

All in all, energy shortage is an important limiting factor in the economic development in Zhejiang Province. As long as we stand on the basis of self-reliance and persist on conservation, it is entirely possible to strive for a sustained growth rate in our national economy.

9698
CSO: 4013/167

NINGXIA URGED TO ACT NOW TO AVOID FUTURE ENERGY SHORTAGES

HK160205 Yinchuan NINGXIA RIBAO in Chinese 3 Dec 82 p 3

[Article: "Do a Good Job in Energy Conservation"]

[Text] Energy is the important material base for national economic development. One of the strategic key points in national economic development in the next 20 years is to conscientiously solve the energy problem. In his report at the 12th Party Congress, Comrade Hu Yaobang pointed out: "To ensure a fair rate of growth in the national economy, it is imperative to step up the exploitation of energy resources and economize drastically on energy consumption." While vigorously carrying out construction in the energy industry, we should do a really good job in energy conservation.

Since the activity of "energy conservation month", which was conducted throughout the country for the first time in 1979, our region has scored some achievements in energy management and conservation. In the first 9 months of this year, the region saved 69,400 tons of coal, 48.44 million kilowatt-hours of electricity and over 6,000 tons of oil. However, some problems still exist in energy conservation, principally because we have not attached proper importance to energy conservation. Some people always think that our region is rich in energy resources, that energy industry output value makes up 30 percent of our total industry output value and that energy has not been in rather short supply. Consequently, they do not feel any pressure and have failed to do a good job in energy conservation. In various enterprises, energy conservation plans are not practicable, instructions regarding energy conservation are not properly implemented, some basic work systems such as statistics and calculation have not been established and energy saving measures have not been popularized and practiced. In recent years, in our region, electricity consumption per 100 yuan of industrial output value has been increasing year after year. In 1979, we consumed 82.8 kilowatt-hours per 100 yuan of industrial output value. Consumption increased to 90.3 kilowatt-hours in 1980 and to 96.1 kilowatt-hours in 1981. In 1981, if electricity consumption per 100 yuan of industrial output value had been reduced to the level of 1979, the surplus electricity could have been used to produce products with output value amounting to 190 million yuan. We should realize that although energy is not in rather short supply in our region, there will be an increasing shortage of energy in the wake of industrial and agricultural development. It is impossible to increase energy production to a great extent in a short period of time,

time, due to limits in the conditions of energy resources exploitation, the construction period and transport. The speed of national economic development will be reduced if we fail to do a good job in energy conservation. Therefore, cadres, staff members and workers should acquire a better understanding of this problem and regard it a support and contribution to the four modernizations to save every kilowatt-hour of electricity, every ounce of oil and every jin of coal.

In order to economize on energy, we should: 1. Take the replacement and transformation of energy-consuming equipment into full consideration. The capacity of electrical machinery of the region totals 200,000 kilowatts; most of it was manufactured in the 1960's and generally consumes more energy. We should organize people to tackle key technical problems and speed up technical transformation, replace the obsolete equipment that consumes more energy with new equipment with high efficiency which consumes less energy and vigorously popularize new technology and techniques in order to save energy. We should set a deadline for elimination of obsolete electrical machinery in accordance with the instructions issued by the state economic commission. We should firmly grasp the work of carrying out technical modification of turbines and automobiles for the purpose of oil conservation.

2. We should do a good job in improving management of enterprises which consume more energy. For many years, coal consumption of the small chemical fertilizer plants of the region has exceeded the national average level. There are seven small chemical fertilizer plants. In the first 9 months of this year, with the exception of the chemical fertilizer plant in Helan County, six of them consumed more coal than in the same period last year. We should change our ways of management and operation. We should make accounts before starting production and not the other way round and grasp equipment, technique and technology simultaneously. At present, no distinction has yet been made between electricity used in enterprises' production and that consumed in daily life. Workshops take the same share of electricity consumption. Those who save electricity are not rewarded and those who waste it are not fined. This situation must be changed. Energy conservation units should be set up and power meters must be installed in all enterprises, so that investigation can be carried out on this basis and appropriate yardsticks can be applied for making appraisals. In such a way, we can truly exercise control over energy consumption and implementation of plans.

In addition, we should utilize coal in a comprehensive way and economize on coal for daily use. Great potential can be tapped in this respect. If a 5-member family in an urban area consumes, on an average, 3 tons of coal annually, then the urban population alone of the region will consume 400,000 tons of coal a year. A large quantity of high grade hard coal is used for heating and cooking. In such a way, the utilization ratio of coal is low and great waste results. We should encourage the urban population to use poor quality coal for heating in order to reduce consumption of high quality coal. In future, new buildings should install heating apparatuses if conditions exist, in order to raise the utilization ratio of high quality coal. Urban construction units should carry out study and investigation on the utilization of gas in order to popularize the use of gas in the urban areas as soon as possible, so as to save a lot of coal and reduce urban air pollution.

CSO: 4013/87

HEBEI ELECTRIC POWER BUREAU URGES CONSERVATION OF LIMITED POWER RESOURCES

Shijiazhuang HEBEI RIBAO in Chinese 18 Sep 82 p 2

[Article by Zhao Jingchen, [6392 2529 6591] Director of the Electric Power Bureau of Hebei Province; "Reaping Greater Benefits From Limited Power Resources"]

[Text] At present, our province faces serious electric power shortages. How can we reap greater benefit from limited electric power resources in order to satisfy the demands of economic development and daily living of the people? Under the present condition of power shortage, this requires us to use every kilowatt hour of power properly in order to reap the proper benefit.

During the present year, no new electric generating unit has joined power production. There has also been little increase in electric power generation according to the plans. Present statistics indicate a shortage of electric power of 0.7 million kilowatts and a daily shortage of 7 million kwh. In order to reduce this inbalance, the workers of the electric power systems must produce safely and dependably, and must reduce the losses due to power outages. They must develop the latent potential of the equipment and work hard toward producing more power and toward increasing the power supply. It is even more important to emphasize conservation of power consumption and to strictly enforce good planning of power usage. At present, there are still some industries where electric power usage is less than ideal. Certain basic industries have been forced to stop production and limit power consumption, although product quality has been good and power consumption has been low. On the other hand, certain industries have produced inferior goods with very little market, yet they have been allowed to exceed their goal of power consumption. Furthermore, certain products require high power consumption but are of little economic value; these products have contributed to the power shortages. Between January and May of this year, the power consumption of the following six products--calcium carbide, silicon iron, steel ingots from electric furnaces, aluminum from electrolytic processes, pig iron and phosphorus--went up by 8.6 percent as compared to the same period last year and have exceeded the quota by 120 million kwh. This increase is not only higher than the average growth of industrial electric power consumption, but is also higher than the increase in power consumption of the heavy industries. If this trend continues, we will be forced to pull the switch to stop the power supply quite frequently and to reduce the supplies of power for agriculture and light industries. Electric power for daily living will also be greatly limited. The economic effectiveness of electric power will also be reduced.

In order to improve the economic benefits of electric power, we must carry out the directions of the State Council of the Water and Electricity Division titled "Temporary Administrative Procedures of Planning for Electric Power Usages in Provinces, Cities and Autonomous Regions". We must perfect the task of electric power distribution with quotas for the rural areas, cities and various industries. Priority should be given to agricultural irrigation, food processing, consumer products manufacturing, construction materials, transportation, city administration and city living, military export products, and export products for trading as planning by our government. We should limit the electric power supplies to those industries with high energy consumption and poor quality and low consumption rate and also to those industries which must compete for more raw materials, more energy resources, and also to those industries which try to squeeze out the others. We should also follow the directions of our superiors and must eliminate the priorities for 11 industrial products such as electrolytic caustic soda, synthetic ammonia, calcium carbide, etc. We should continue the installation of automatic power control devices and try different power prices for peak and valley power demands. We must control power usages over quota. We must encourage power usages in the "valley" (low load) periods, thus improving the efficiency of the electric power grid. Every industry must seriously carry out the energy conservation orders of the state council of the central government and must specify the electric power consumption quotas at every level. Every industry must expand their efforts to examine electrical power consumption and to reduce the power consumption for their products. Every industry must improve their equipment and work on energy conservation technology, such as improvements on medium temperature electric furnaces and low temperature electric heating via far infrared radiation. New technologies should be used to improve the circulation fans, water pumps, electric welding machines, alternating current converters, etc.

We should eliminate the "electricity eaters." Because of the increased number of household appliances, energy conservation in households is also very important. In the cities, the fixed fee system for electric lighting should be eliminated whereas different electric meters should be installed for different consumers. For illumination and power in rural areas, different meters should also be installed. Electric meters should be gradually installed for every household. We should also eliminate light bulbs with high power consumption ratings, "always-on" light bulbs, and unrealistic electric heating systems. We should plug all leaks for electric power consumption such that electric power may be benefically used. Thus greater benefits in economic development and in living standards of the people may be reaped for limited power resources.

9899
CSO: 4013/14

CONSERVATION

HEILONGJIANG MEETING ON POWER CONSERVATION HELD

SK181309 Harbin HEILONGJIANG RIBAO in Chinese 31 Oct 82 p 1

[Excerpts] The provincial government held a meeting on the "three electricity" work [conserving power, using power in a planned way and relying on the masses in running power stations] from 26 to 30 October, urging all urban and rural areas and all trades and professions to do a better job in this work in order to create a new situation in all fields of socialist modernization. [passage omitted]

The meeting called for efforts to strengthen the overall balance in power utilization, and to further implement the policy on using power in a planned way so as to make the limited electric power produce the best economic benefits. Under the situation in which power is in short supply, we must give priority to arranging power supply for agricultural drainage and irrigation, food grain processing, production of daily necessities, energy industry, communications and transport, war industrial production, building materials industry, urban construction, people's livelihood and production of exported goods. We must organize the people to use power in a balanced way, fulfill the taks of avoiding power usage during peak periods down to the level of mechanical units and machine operators, and must systematize this practice.

The meeting stressed: efforts must be made to comprehensively implement the relevant stipulations of the state council, to expedite the speed of power conservation and to achieve beneficial results. Earnest efforts must be made to fix power supply quotas to enterprises in accordance with their power consumption in producing a type of product. During the winter-spring period, all competent departments must check and fix power consumption quotas for products in all enterprises. The power consumption checking work of the province's 1,500 largest power-consuming enterprises must be undertaken first. We must persist in the principle of supplying power in order of priority under the tense situat-on in power supply.

Chen Jianfei, secretary of the provincial CPC committee and deputy governor, attended and spoke at the meeting. [passage omitted]

CSO: 4013/87

CONSERVATION

LIAONING INDUSTRY TO CUT ENERGY CONSUMPTION BY 50 PERCENT

OW240123 Beijing XINHUA in English 0743 GMT 23 Oct 82

[Text] Shenyang, October 23 (XINHUA)--Major factories in Liaoning Province, China's biggest center of heavy industry consuming ten percent of the country's total energy output, reduced energy consumption by 5.9 percent in the January-September period while increasing output value 6.58 percent over last year's like period.

The province's energy conservation office released the figures after a survey of 90 major enterprises that consume 70 percent of Liaoning's energy. The savings is equivalent to 1.4 million tons of standard coal.

Liaoning suffers from a serious energy shortage and plans to cut energy consumption 50 percent by the year 2,000 while maintaining a steady industrial growth, according to the office.

The energy savings mainly came from technical transformation of high-energy-consuming factories and more emphasis on products using less energy, said Wang Xingrong, who is in charge of the province's energy conservation.

In 1979 the province began to slow down the pace of heavy industrial growth and shift emphasis to light and electronics industries. Last year light industrial output value was running at 37.6 percent of the provincial total as against only 26.7 percent in 1978.

Quite a number of small energy-gobbling plants including those making nitrogenous [as received] fertilizer and calcium carbide and iron and steel have been shut down, merged with other factories or converted to other products.

From 1980 to 1982, the province invested 800 million yuan in 417 energy conservation projects. When completed, these projects may save the equivalent of 820,000 tons of standard coal and 210,000 tons of petroleum a year. So far, 390 of them have been completed.

The province has also imposed metering and quota systems on enterprises consuming over 20,000 tons of coal or an corresponding amount of oil annually, rewards are given for underconsumption and penalties exacted for overconsumption. An assessment of 913 processes in 830 enterprises in the first half of this year showed that 716 of them were consuming less energy than the quota allowed.

CSO: 4010/25

CONSERVATION

SHANDONG OFFICIAL CALLS FOR CONSERVING ENERGY

SK120807 Jinan Shandong Provincial Service in Mandarin 2300 GMT 11 Dec 82

[Text] At the recent provincial energy conservation work conference, deputy governor Liu Peng pointed out: All industrial and communications enterprises throughout the province should rely on science and technology to increase production, set the tempo of production and efficiency while reducing energy consumption. In 1983, our province should cut down energy usage by over 2.5 percent as compared with 1982. The energy consumption target for producing some major products should strive to achieve the advanced level found for the same trade throughout the country.

Deputy Governor Liu Peng stressed: In order to realize this objective, we should attend to four tasks.

First, we should attend to the study of the documents of the 12th Party Congress in order to deeply understand that energy occupies a strategic place in the development of the national economy. Efforts should be made to firmly foster a long-term ideology of energy conservation. First priority should be given to energy production and energy conservation.

Second, advances must be made in science and technology to reduce energy consumption. We should further call on all departments and all enterprises to research and spread new energy conservation techniques. We should try all means possible to design and manufacture efficient facilities for conserving energy to supply economic sectors with advanced techniques and advanced equipment. We should concentrate the technical innovation on energy conservation to raise the utilization rate of energy. Efforts should be made to spread mature experience in conserving energy and to expand the effectiveness of energy conservation.

Third, efforts should be made to lay a foundation for the energy conservation work to raise the level of scientific management. Those enterprises that incur high energy consumption, heavy losses and overstocking of productions should be forced to shut down, suspend production, merge with other enterprises and change their lines of production.

Fourth, we should strengthen our leadership over energy conservation work. All prefectures, municipalities and departments must set up organizations in charge of every conservation work and train some technical cadres in order to carry out this work.

CSO: 4013/87

CONSERVATION

WIDER USE OF ENERGY-SAVING PRODUCTS IN MACHINE-BUILDING INDUSTRY

OW281628 Beijing XINHUA in English 1608 GMT 28 Oct 82

[Text] Beijing, October 28 (XINHUA)--China's machine-building industry has called for the wider use of 40 newly-developed energy-conserving products.

In accordance with a recent joint decision of the Ministry of Machine Building and the State Economic Commission, production of 16 obsolete products whose consumption of energy is considered excessive will be stopped.

This latest move is a major step taken to ease China's energy shortage, a bottleneck in China's economic construction, said a spokesman for the Ministry of Machine Building.

The ministry has developed more than 100 energy-saving products in the past few years and chosen from them 40 for mass production, he added. One is a new-model "Jiefang" ("Liberation") lorry which consumes 21 percent less oil than the old model. The vehicle is produced by China's No 1 Motor Vehicle Plant, which was started in the 1950's and is being renovated with the latest technology.

The joint decision requires all factories in China to stop on 1 January 1983 producing 15 of the 16 obsolete products, including boilers, pumps, ventilation equipment, transformers and other machines with a poor energy economy.

"China can't afford to continue using obsolete technology and equipment to produce obsolete products," the spokesman for the Ministry of Machine-Building said.

Energy consumed by Chinese enterprises in producing every 10,000 U.S. dollars in terms of national income is equivalent to 32.6 tons of standard coal, compared to 5.5 tons by Japanese enterprises and 13.1 tons by British enterprises, according to earlier news reports.

CSO: 4010/25

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